

AVIATION

The Oldest American Aeronautical Magazine



Twin Wasps over the Rockies

To keep pace with rapidly expanding patronage, Continental Air Lines is adding to its fleet a group of high-speed Lockheed Lodestars.

Continental operates out of airports high in the Rockies. This calls for extra power at take-off. And so, each of these new Lodestars will be powered by dependable Pratt & Whitney Twin Wasps.

PRATT & WHITNEY AIRCRAFT

One of the three divisions of
UNITED AIRCRAFT CORPORATION
EAST HARTFORD, CONNECTICUT



"FACTORY OVERHAULS" AT CALDWELL WRIGHT



WRIGHT ENGINE OVERHAUL DEPT. at Caldwell Wright Airport, Caldwell, N. J., where Texaco Aviation Gasoline and New Texaco Airplane Oil are used and stored 100%.



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MORE SCHEDULED AIRLINE MILEAGE, WITHIN THE UNITED STATES AND TO OTHER COUNTRIES, IS FLOWN WITH TEXACO THAN WITH ANY OTHER BRAND.



TEXACO Aviation Products

When the **STRATOLINERS** land

the world's safest wheel equipment carries the load



Photo courtesy Transcontinental and Western Air, Inc.

TO CASEY its great new 45,000 pound Stratoliner safely down the runways—to cushion softly their landings across the continents—TWA has specified also Goodyear landing wheel equipment.

The huge Goodyear 35 x 18-10-12 High Pressure Tires (fused with Goodyear tubes) are the largest ever used on an American commercial transport. Even the tailwheels are 33" x 8-1/2" Goodyears.

The wheels are Goodyear H-D type equipped with Goodyear Hydraulic Disc Brakes whose self-cushion, non-binding positive action slows down these heavy ships to a gentle effortless stop with maximum landing run.

Goodyear congratulates TWA on the launching of these magnificent Stratoliners and is proud of its contribution to their safety, efficiency and comfort. If you have a landing gear problem, our engineers will be glad to consult with you. Address: Aeromarine Department, Goodyear, Akron, Ohio, or Los Angeles, California.



Note use of giant Goodyear 35 x 18-10-12 Low Pressure Tires—used exclusively on the TWA's Stratoliner fleet.

THE GREATEST NAME IN RUBBER
GOODYEAR

ON YOUR NEW SHIP SPECIFY GOODYEAR AIRPLANE TIRES, TUBES, WHEELS AND BRAKES

AVIATION
June, 1940
1



Howard Model EGA-131 powered with 338 H.P. Engines

A Comfortable Ride is a Safer Ride

▶ The Howard for 1940 gives a more comfortable ride in turbulent air than any plane in its price-power class. High wings and low center of weight contribute to this characteristic.

▶ The ability of this airplane to "screw through in the groove" is likely its outstanding appeal to the well-minded because they know that safety, caused by "fighting rough air," does not elude them which is essential to safe approaches and landings.

▶ Another notable advantage of this superior design is an ability to maintain full cruising power. There is no need to "strutle back" as one can take the bumps in order to get there physically fit.

▶ There is yet another merit which this airplane possesses—a capacity which permits 1000 to 1250 mile non-stop trips without overloading at take-off. This is liked by many who look volume as a practice not tolerated by the airlines.

FLYING IS BELIEVING Words or plans cannot prove these assertions. See them at our dealers or the Factory for a demonstration. Read for the Airplane.

Howard for 1940

HOWARD FLIGHT CORPORATION • 5105 W. 131st STREET • CHICAGO, ILL., U.S.A.

AVIATION
June, 1940
7

*For quick expansion of working surfaces
at predetermined cost . . .*

Specify

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Fig. 102
Steel work
bench, 30" wide,
36" high, 48" deep.

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Too, at an extra cost, "Hallowell" Benches provide advantages found in no ordinary



Two or more "Hallowell" benches easily can be converted into one smooth continuous working surface—or the long bench made into single units.

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Added up, these advantages are difficult, if not impossible to get when you elect to build your own benches. It will pay you to investigate "Hallowells"—write for our complete catalog today, now!

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AVIATION

June, 1938

13



VICKERS

HYDRAULIC ACCUMULATOR FOR AIRCRAFT

**... Engineered to a life-long job
of "GIVE and TAKE"**



Used to maintain hydraulic system pressure while pump is stopped or unloaded and to supply auxiliary volume during intermittent peak demands . . . the Vickers Spherical Hydraulic Accumulator is built for a lifetime of "give and take." • Made in 18" and 5" sizes. Descriptive data on Accumulators as well as other Vickers Hydraulic Controls for aircraft is available.



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Hydraulic Accumulator
Construction

VICKERS Incorporated
1462 OAKMAN BLVD.
DETROIT, MICHIGAN

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6440-82 175 hp. with 65 octane

6440-82 180 hp. with 72 octane

6140-84 160 hp. with 65 octane

6440-85 200 hp. with 87 octane

12 cylinders

508-770-83 475 hp. at sea level

with 87 octane

508-770-84 490 hp. at sea level

with 87 octane

508-770-87 510 hp. S.L. to 8000 ft.

410 hp. at 12000 feet

with 87 octane

NEW RATINGS FOR RANGER

The wide scope of the new Ranger ATC ratings will be of instant importance to those men of vision who have given thought to the Ranger in-line principle, and its application to modern aircraft design.

Spotlighted by these new ratings are such major features as increased power for take-off . . . increased power for cruising . . . decreased specific fuel consumption . . . features that open up many impressive new vistas of performance and efficiency.

But eloquent as they are, these facts are only the bare bones of a more vital and significant story. They tell nothing of the designer whose toil and inspiration translate theories into realities . . . of the machinist whose cardinal creed is precision . . . of the testing engineer who brooks no compromise with perfection! These men and the rigorous principles that guide them are the firm foundation on which the entire edifice of Ranger dependability is based.

RANGER AIRCRAFT ENGINES

Farmingdale, Long Island, N. Y.

DIVISION OF FAIRCHILD ENGINE & AIRPLANE CORP.

MAJOR AL WILLIAMS also "Colored Wings,"
New York Herald Tribune, Call Side, Pittsburgh, Pa.

Right up to the line, when the leader is being headed out, should be the most important place where a successful professional is flying. Because, if the professional in the animal leader is showing John Q. Public it can be done, the message has to get past. The job—and he usually does it—showing J. Q. that he, himself, can do it, too.

Everywhere we go
people are reading
degrees. Degrees in
words — degrees
magazines — de-
manded business.



That's where you'll find him scribbling on our cuff as we wait. Because that's precisely where the Golf-ruined Aklavik players—and millions of us—reconcile: methods—don't see Golf's 18-hole, 4-day drive deeper into the 18th century—depend on up to 20% more in performance. Like other and the best.

In how many ways can he make the round trip so that the revenue by air fare on individual return does not exceed a return?

Class: Science

Eight is the beginning I was joined by a
 four on my right, then a four on my left, till
 all the instruments were way out in front.

The second step around found out will far
 that behind. Being loved by the operation
 was had enough, but being ordered by the

day you see. I decided to run around for the third time. Then came I was ... but instead of making out his tongue to me, he ...

THEY ARE NOT. Further, even when the law is

for the Gulf Avenue. Got stuck at what he'd been planting. I grabbed a barrel of G.A.G. and rushed back to my tent.

Myra: ...we help me when I cannot do the job again. I paired these white ladies with others like Father's young man, so that when I lost most of the Gaps, I was going to find that the girls kept carrying on. For me and the sponsors had to forget about working the same old ways as me.

I encouraged growing legs and picking up speed. Third, last thing I knew, I looked back and there was the line and of course

The speed steadily increased all I got close enough to give myself a kick as the

Steve Cunningham

Gulf Oil Corporation and Gulf Refining Company, owners of


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GULF AVIATION
PRODUCTS

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June 1997

We believe we can add to your salary and enjoyment by suggesting that you use the finer Stinson "105" because it is the only non-sporting plane which offers all of

the following up-to-the-minute advantages. It gives you the benefits of an unqualified salary record. Its priceless Wing Shots strike exactly at unionist's faults and spine which caused 90% of the workers to

its Flaps make slower landings practical. Hydraulic Brakes insure shorter, smoother stops. Spring-hydraulic Shock Absorbers another landing gem. It can be flown safely on gusty, windy days when flying lessons with smaller planes are halted. It descends

Its roomy cabin for three offers extra comfort and quietness. Just as you shed all enjoyment in your smart new car, you can get teenage pride and pleasure from the richness and taste of the "006's" styling and appointments. Above all, it's a plane with the mile speed and 21 miles to the gallon economy for pleasant cross-country trips.

Shinn's "105's" are available for instruction purposes at most airports. You are justified in demanding instruction on a Shinn because of the exclusive advantages it offers you. If your instructor does not have a Shinn, won't you please send us his name and we will explain to him why it is to his advantage to own one. Or, if you prefer, we will gladly send you a list of capable instructors who have new Shinn's "105's" available for your use.

Nashville, Tenn.

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AVIATION
June, 1948
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THE
Lockheed
LOG



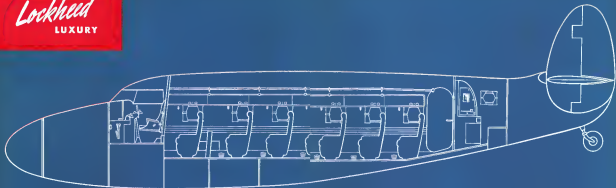
Speaking of Lockheeds

TALK SHOP WITH A PILOT Ask him why he prefers a Lockheed flight, and here's what you'll hear. First, a Lockheed seems to be part work home and part race home. It's built to withstand the stress and strain of all kinds of flying. It has that dependability which comes only from the intricate care and research that go into the development of Lockheed methods.

Then... a pilot will tell you, this same dependability responds to comfort with the smooth ease of a small airplane. Pilots prefer Lockheeds because they know airplanes, because they know that every Lockheed aircraft was made to standard models, and because a Lockheed flight is exhilarating, easier and faster. Lockheed Aircraft Corporation, Burbank, California.

LOOK TO **Lockheed** FOR LEADERSHIP

Lockheed
LUXURY



REMEMBER, we call it the

LUXURY LODESTAR...Here's why..



TALK SHOP WITH A REGULAR AIRLINE TRAVELER

When he's flown in the new Lodestar he'll give you enthusiastic reasons why he prefers this airplane to other airline transports.

First—he gives him **SPACE**... ample space to himself! For 14 passengers there are a full 747 cubic feet of cabin volume! Then, every seat has a window all to itself. **PLUS** ample space for a long stretch in the aisle. A twist of the wrist will adjust the

seat from a 5° to a 40° reclining position, and he can lounge to either side without rubbing shoulders with another passenger.

He experiences the advantages of ingenious planning which you see in the cut away blueprint above. There's head room... leg room... stow room for tall men, and deep-cushioned comfort for the most fastidious woman.

LOCKHEED AIRCRAFT CORPORATION • BURBANK, CALIFORNIA

TALK SHOP WITH AN AIRLINE OPERATOR

He prefers Lodestars for dollars and good sense reasons because he knows that every Lockheed has been designed with **HS** operating problems, foremost in mind.

Other Lockheeds have won his loyalty over a period of years because they were **Trojan** he could operate at a profit.

Now comes the Lodestar, which surfaces as one famous Lockheed

performance superiority, and yet offers the real lounge comforts that passengers have come to demand. It carries fourteen paying travelers in luxury, which is the equal of any

transport. Yet it's a sound, economic, airline investment because it attracts more passengers and more revenue. It's a typical Lockheed—another reason operators say—

Model for Model

LOCKHEEDS carry greater pay loads at higher speeds... at lower costs!



Pilot Francis McDonald, under the wing of the Byrd-Proctor Lockheed

TALK SHOP WITH A PRIVATE OWNER

D.H. Byrd, president of Byrd-Proctor Inc., Texas drilling company, is a typical Lockheed owner. He'll tell you his airplane is luxurious, but not a luxury... rather, he considers it a business necessity.

For busy executives like Mr. Byrd, Lockheeds have much to offer. Their **SPEED** enables owners to make their own time tables—and arrive hours ahead of regular schedules. Their **COMFORT** brings the traveler to his destination fresh and relaxed. And their **QUIET** transforms each airplane into a commodious office in the sky.



INDUSTRY ORGANIZES For National Defense

ALERT is what is happening in Europe, the American people are being set to strengthen their defenses against aggression from any quarter. Already the government has laid down an initial program to that end.

The recent defense against aggression is the delay to meet it. If we are known to be well prepared we may never attack. If we cannot meet it we shall be forced against it. But preparedness against war means preparation to wage war.

And modern war is an industry. Like every other industry, it is a matter of men, materials and machines. Fighting men must be skilled workers, trained to use an arsenal of special tools and equipment that we just as diversified and just as essential to success as those of any other industry.

The plan, supplies and personnel of war must meet in efficiency those of any peacetime industry. For the orders of success or failure in war are not paid in money profits or losses, they are paid in the lives and property of the people, in the security—perhaps the survival—of a nation.

* * *

Sound national defense calls first for a comprehensive program, carefully planned to back up a clear cut policy in what we expect to defend. Now comes the organization of funds to make that program. These first steps are vital; they are up to government.

This program and organization must be transferred into performance. Nations are materials must be produced, purchased and stored. Our major supplies of strategic materials of foreign origin must be built up and we have accumulated ample supplies against the use and misuse of force. And most urgent, because it is most complicated, our materials must be manufactured into the formidable arms required to equip the modern war.

We at McGraw-Hill, long with American industry as we do, are largely aware of the effort that will be required to produce the materials and equipment now needed to moderate our national armament.

Tanks and anti-tank guns, airplanes and anti-aircraft guns, machine guns and automatic rifles, trucks and tractors, destroyers and supply ships—these are but a few items from the endless armament of industry and naval equipment that we must produce by scores, hundreds and thousands, even to men on land. From these items, indeed which we might call our national armament for defense effort.

Obviously the army and navy must create an American industry for a simple and continuous supply of this equipment, and industry must organize to produce it in vast quantities. This means the construction and adaptation of manufacturing, transportation and storage facilities, the organization of competent executive and technical staffs, the training of skilled craftsmen in numbers adequate to maintain existing production schedules. All this, in itself, is an industrial organization problem of the first magnitude, but upon it is imposed still another and vital specification—national speed.

For none is the all-around significance of modern war. It cannot be fought with any approximation, however great, once lost, a nation is not a nation; we must either achieve it or while we will have it. And in this process we have none to waste in fumbling, jockeying or experiment.

* * *

Two courses are open to carry out such a program:

1. We might adopt the modern plan of monopolizing industry, monopolizing the wealth and labor of it, and suppressing the normal movements and management of industry in favor of the authority and control of government officials.

2. Or we can seek to the American way of achieving national unity and efficiency by intelligent cooperation between industry, labor and government.

There are those to whom the first will appeal as being the more direct. But I am convinced that most Americans will note that the job is done in the American way. And in this preference the President, speaking for government, already has indicated his preference.

Up where instruments
count most...



TWA counts on

Pioneer INSTRUMENTS

Our congratulations to
TWA on its new fleet of
BOEING 307

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Pioneer-Equipped

WHEN an airplane climbs and cruises
"above the weather," then instru-
ment equipment becomes all-important.
With the whole of air-minded America,
Pioneer joins in sincere salute to Boeing
and to TWA. As each of the magnificent
new Boeing 307 "Stratoliners" begins its
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full complement of tested Pioneer in-
struments go to work — a total of 33
flight, navigational and auxiliary instruments
bolstering instruments.

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sake of every aviator.

AVIATION

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Established 1887

JUNE 1940

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AND IN INDUSTRY WITH INDEX

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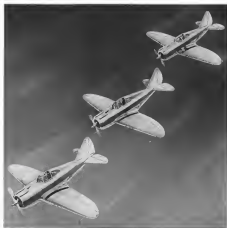
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REPUBLIC AVIATION

19 PLANES IN 22 DAYS! . . . Last month, 19 first-line combat planes—checked to the last detail of equipment and flight-tested with full armament—moved from the Republic Aviation plant to purchasers. Republic's emphasis on Man Power—men selected for character, ability and skill, in an efficient and harmonious organization—keeps production moving on schedule, results in on-time deliveries . . .

Republic is ready—for today's job and tomorrow's!

REPUBLIC AVIATION CORPORATION

* Former name—Seversky Aircraft Corp. • FARMINGDALE, LONG ISLAND, N.Y.

AVIATION
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Needed—A Program for Defense

THE THREE-DIMENSIONAL MILITARY OPERATIONS of the last few weeks have shocked the entire world. To those of us who are familiar with the airplane and its possibilities, they are no great surprise. We have foreseen and frequently forebode these terrible events. But the layman who has been slow to realize their import has suddenly discovered their possibility.

As a result, his impression in the Congress now is full accord with the President's proposal to build up our defenses.

The President has asked for a production capacity of 10,000 airplanes monthly and for trained men to fly them. He has made no mention of what types of planes he wants or when he wants them. Until some time has yet, such a request has little meaning.

We cannot afford to ignore the experience of the British and the French in their efforts to build large quantities of aircraft in a hurry. It required several years for the British "shadow plant" system of production to reach the generally accepted capacity of 1200 planes per month and that estimate may be a generous one. The French industry has never fully recovered from the setbacks at several earlier times made several years ago.

We are more fortunate than other nations in having a large number of skilled mechanics and machine tool operators. But no matter how skilled these men may be, they will need addi-

tional training to fit them for the pressing requirements of aviation work.

And we cannot operate our aircraft from country roads or city streets. We must have bases and more bases and adequate housing facilities at a time when airports are few and housing space is at a premium.

At the present time we have 23 plants at work on military flying equipment and an equal number doing non-military work. Obviously much of the latter can be put to work as subcontractors for the others. But we must also develop the substantial aircraft industry. Our significant air transport system would be an invaluable asset in our preparation for defense. At this very moment it is faced with an equipment shortage. We cannot afford to ignore its condition in a defensive program.

The light plane industry has been doing a fine job in the mass training of pilots. We must remember also and re-examine the possible applications of this type of equipment before we decide how this branch of the industry must effectively be used. No nation has fully enhanced the military possibilities of all types of aircraft.

We must be thankful as a nation for our removal from close proximity to the most powerful air forces. We must not feel too bad. But we can't afford a stampede.

First we must decide on the geographical location of our frontiers. Then Congress must provide the necessary funds and modify the present laws to suit the occasion. Then the industry must confer quickly with Army and Navy officials and make a plan based on the attainment of a specific productive capacity in a specific period of time. Coordination must be given to expert and domestic military needs, as well as the requirements of non-military operators. Subsidies must be modified to protect the industry proper from over-expansion. In order to insure the training of both pilots and mechanics and the establishment of bases and housing facilities must be reconsidered in the light of the new requirements. Then, and only then, will we be ready to go forward humbly and audaciously to our greatest challenge and fulfill our duty to our country.

FLY AND GROW FAT should be the new slogan of the aviator. If you are a pilot you can plan your trip to fit your own needs—business, lunch, snack, dinner, evening meal, and some other station stops, all in a twelve-hour trip. It is a new manner and we enjoy it.

We learned that this making a "route tour," with our objective the Third Annual Southerners Conference at Tulsa, via TWA, Braniff, American, Mid-Continent, and Great Lakes (We speed our passengers.) Look

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was with us and we picked up a ride from Tulsa to Kansas City Mid-Continent's first Lockheed. With its Hornets, the ship is fast, gets all in a hurry, and appears to be overdue for operation out of several airports. Interior is pleasing and comfortable.

A good deal of attention to new equipment is being made at the Tulsa maintenance base at K. C. Mid-Continent is looking up for the new Lockheed and Dick Bergman is busy meeting new pilots to make their servicing easier and more economical. One at TWA, Ed McFarland, who took over when Walt Blumhouse went to Douglas, is getting ready for the first Beechcraft which should be there when this is printed. The big biplane will attract a lot when the new Airways start coming to the service. It looks much better with DC-3s than it did in the days of the DC-3s. TWA plans to clip about 31 hours of maintenance schedules with its new equipment. Only step will be Krome Corp.

At Wichita we visited Walter Beech and saw some of the two-engine equipment he is building for the Air Corps. The engineers at back of those short metal jobs compare with the fine finish of the future covered Beechcraft. Even the air was brought home in so when we saw a Cessna Beechcraft filled with "Machos" (pilots) in the air. They are available for the pilot and cover all windows on each side simultaneously.

Over at Omaha, Proctor Glenn took us around and showed us how they build the T-30. Proctor is an old man and he remembers what happened in 1920. Omaha will undoubtedly benefit from his good memory. There's always more capacity in the old plant if you look hard enough for it. This is the second philosophy of Stinson's Earl Schreier, who also remembers 1920. Accordingly you find planes around his plant for selling and other reasons that tend not to be spread all over the area. There is a military element and one of production flow throughout this plant that is nothing short of amazing. Most of the available space is fabrication and sub-assembly is used but there is no sign of chattering. Final assembly is so clean and dry that it is hard to believe that business are flying off the line at a rate about as high as that of the largest light plane manufacturers. And at present only one of the three final assembly lines are in use. Light plane production men should visit the Stinson plant

and observe how it is done there. Sports is coming out with some new production tests and we saw some fine stunt work and excellent power flying in the last Executive air one trip through the plant with Warren Kellady and Chief Engineer Werning. Under the new ownership of Tulsa's general and land-lord Ed Stolz, both plant and school have improved. Captain Maxwell's father (whose article appears on page 14) has reported your military standards to the engineers and your immediate impression is responsible to that experienced at an Air Corps training center.

FLYING WEST is Jack Fry's "Sea Plane" the other day we were listening to the radio. Just as the release was about to pull the trigger something pulled the plug and the radio stopped. We never heard out

whether or not the number was completed. Enclosed we mailed you the postcard for use of those "Dear Jack" suggestions before and wrote a whimsical illustration of the radio plug. A short while later the plug for the sea about fell into our lap and now it is the opportunity to perform a service for the airplane fan who can't fly. In fact it was the opportunity we had hoped for during the radio flight. After we had succeeded in showing how plane number we were up the "Dear Jack" letter, attached in the other postcard for a fresh blank and wrote Dear Jack. The letter is not please don't print any more plugs that really stick at your airplane.

IT TAKES TO FLY



Magazine is planning to include 50,000 airplanes

AVIATION
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Prepared...

TO LIGHT AS WELL AS TO FIGHT!



It will leave you-right and alive.

With BENDIX LANDING GEAR

Being ready for the landing, Bendix retractable landing gear saves countless seconds by hydraulic cushioning in proper preparation, while Bendix Brakes provide stoppage and efficient ground maneuverability.

AN easy set-down, as well as a positively controlled take-off and taxiing run are assuredly quite as essential in a combat aircraft as in any other service.

Bendix Pneumatic Shock Struts, Wheels and Brakes are favorite military airplane equipment just as speed, maneuverability and reliability safeguard the personnel in flight, so do these Bendix Landing Gear units safeguard men and machines during those critical moments of ground contact.

Successful landing gear design is a matter of close co-operation. Such matters as the plane's weight, disposition of that weight, landing and take-off speeds and internal structure of the landing gear, usually have a vital bearing on proper landing gear design, distribution, location and construction. The entire Bendix team are called, the more useful their skill and knowledge can be.

BENDIX PRODUCTS DIVISION
OF BENDIX AVIATION CORPORATION - SOUTH BEND, INDIANA
AIRPLANE WHEELS • BRAKES • PILOT SEATS • PNEUMATIC SHOCK STRUTS

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Side Slips

By
ROBERT OSBORN

WHEN we're just old-fashioned or smug, let us be assured by the greater satisfaction out of the yearling sales record of the airlines that we did not see the proven effectiveness of aircraft in blinding and anti-blinding.

However, paradoxically enough, we need much bigger "anti-blinding" airplanes in the Army and Navy of this country to insure that our airlines can continue to make safety records in peace.

REMEMBER WAY BACK in the dark old days when piston ships used to be equipped with one or two ad hoc machine guns, and even then were referred to as "flying forts"? We use the paper monthly that say anti-aircraft gunners or fighter crews a couple of minutes in addition to four or more machine guns.

Any day now we're expecting that military aircraft designs will be

THE PROBLEM of the President's proposal to place the Civil Aeronautics Administration under the Department of Commerce, and to eliminate the Air Safety Board will probably be settled one way or another before this appears in print. He is quoted as saying that two reasons for the proposal are that it would slash some top C.A.A. salaries and would reduce the number of agencies reporting directly to him. Considering these reasons we can't see why the change isn't carried to a logical conclusion. At one time there wasn't any governmental record of aviation at all. Of course a lot of people were killed—but then there was no salaries paid out in either the Department of Commerce or the Civil Aeronautics Administration, and nobody reported to the President—only to the local Council.

THIRTY-THREE THINGS as Robert Osborn says are BENDIX items were shipped last week by American Airlines from Boston to Los Angeles at the request of Montague Cook, who, who wanted an authentic New England menu for a party he was giving. The cost of shipping the food by air express was \$20.36, in addition to \$6.30 for telephoning the order. "—*News from M. F. Norrell Tribune*

We know that a sense of complaint will be inevitable from our local aviation reader but we must say that so far as we are concerned this represents an all-time low in airplane transportation. As the fellow says we can take our baked beans and send or

leave them by, and we always leave them by.

A NEW YORK DISTRICT ATTORNEY claims that a Brooklyn "Herald Mail" was busy professional leaders around in the different cities, where their services were desired, in airplanes.

My! My! It's downright disgusting that people should be using work a potentially powerful invention as the airplane as a means of killing other people!

AS CAREER, late of Altona prison, was reported to have always said a standard statement whenever the police came around to ask questions concerning certain suspicious delin-



ties between the Capone gang and other gangs—which was "We don't want no trouble."

There's lots to be considered in that statement, and we suggest that it be used as a slogan for our national preparations for national defense.

ALSO, it's not an inappropriate motto for the engineering and service departments of any airplane or engine manufacturing company.

WE'RE JUST VISITING at a weekend time for a picture to be used in the advertising for an airline. With the ship standing at the landing ramp here a handsome pilot looking out of the pilot's cockpit window and changing planes with a beautiful woman standing in the foreground just in front of the wing of the plane.

There will be no charge as any airline wishing to use this picture in any advertising—in all of them have been using it continuously since service was started. First thing you know the flying public is going to get the impression that all flying personnel of our airlines spend their spare time going around picking each other.



used to turn out airplanes of this type adding a French "TF" and carrying anti-submarine" guns like

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AT THE FAIR...

the public will get an airport-ence
view of all that is new in the aeo-
nautical world.

EVERYTHING pertaining to aeronautics has taken on a much deeper significance than it had a year ago. From past the annual fair the nation's greatly intensified interest in aviation will be the Aviation Building at the New York World's Fair. Even the vastness of the latest aviation-minded visitors will be satisfied with this year's show.

Many new features have been added to the aviation display. Most striking exhibit is a moving panorama of beautiful aviation pictures in color which creep across a gigantic screen. Photographs of all phases of private, commercial and military aviation are assembled in a unique parade.

A number of new military airplanes loaned by the Army and Navy are exhibited to show the public what is new in fighting ships. These include a Douglas bomber, a Curtiss-Wright P-40, a Bell Aircraft, a Navy Grumman, an SNC scout bomber, and a Vought-Schweizer.

Several private planes in various price classes are on the line and available for any inspection. The six-way mockup of the large Curtiss-Wright Transport, which was one of the big attractions last summer, will again draw the crowds.

The airlines have continued to put on an even better show than they had before. With air travel booming to new high seas, the lines are using the public behind the scenes to show the organization that makes it all possible. Visitors at the Fair are being acquainted with airplane operations, overhaul of engines and accessories, and the operation of many parts of a great transport. Meteorologists are at work plotting their weather data and forecasting conditions. Depending on air traffic control, radio operation and other air-

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Woody Brown, twice winner of Arvin soaring meet, left, with John L. Roberts, noted designer, stand in front of Brown's Justice Super Albatross glider.



L to R: Henry Ray Cooper, manager of Southern California Soaring Assn., Don Brown, who built world's glider last year, (center), Wm. Henry Berlin, Arvin pilot.



L to R: Wm. G. Brewster John LaBonté, and Dr. W. B. Klempner with the Wright Super-wing sailplane Arvin pilot.

Right is possible lower tow rope after glider release, preventing whipping and tangling of rope.



John LaBonté, winner of second place, flying the Superflygite sailplane. Arvin pilot.



Seen here in the cockpit of the Bell sailplane "Cherokee", while Ben Hill returns under cover and by horse, reaches the new low, Arvinian pilot.



A real feature of this year's meet was the large number of pilots who put up really good performances. Three pilots added legs to their list: W. C. Klempner, riding his high, farthest, at distance, and eight pilots won the coveted "C" certificate as soaring pilots by staying above the point of release for a duration of five minutes. Some 23 Pacific Coast soaring pilots have now qualified for the "C" rating without which it is not possible to compete at Elmer. Although Woody Brown took first both for duration and distance, the maximum altitude was established by Wm. G. Brewster, who finished down in eighth place for all-around points. Another example of the classiness at the contest was that Henry Steinmeyer, who came within four minutes of matching Woody Brown's total duration, and who actually exceeded Brown's duration point score because of extra credit for his longest flight, was down in fourth place in the final standings. While the winner had a total of 2,386 points, there were eight pilots who had more than 1,000 points.

So far this year's performances outdone those of previous Arvin meets; that the future for Western soaring looks very bright indeed. The weather was almost ideal for the full period of the meet, yet numerous flights were made on rather hot and gusty currents at distances of 25 to 30 miles. And on the one storm front of the meet high Brown and Robinson made a notable team flight of 178 miles across the divide. Negroes, desert to 25 miles, small desert country more than 100 miles east of Los Angeles.

Good prizes were won for flights to various coast lands in the vicinity, including Lober, Gorman, and Grapevine, while numerous goal flights, at

goal and others flights were made without special prize money. Close flights were made to Grapevine and more, a distance of 30 miles each way, and five pilots flew over the flat valley to Arvin and return, a distance of 10 miles each way. Interesting and significant is the chart of cross-country flights, which showed that they resulted in almost every point of the compass. It is not too much to expect that next year's distance flights will be limited only by distance, as marked was the distance flights this year.

A classic example of the sort of soaring done in Arvin this year, was the episode of Henry Steinmeyer, who came drifting down to a landing about 9:30 at night on the last day of the meet, after almost everyone else had packed up and gone home. His crew had supposed that Steinmeyer was down somewhere in a cross-country flight as there were no lights on the field and he landed in almost total darkness. He had been soaring all day high on the slopes of Bear Mountain and had stayed up there among the crags and peaks even after sunset, although all duration time was automatically counted to sunset only. Then came Bear Mountain, horizontal much at the apex of the meet for, and the Elmer horizon, the geography in the Arvin area is extremely rugged. Bear Mountain rises to an altitude of about 2,000 ft., about 5,000 ft. above the Arvin table-top of the slopes are heavily wooded and marked in places by great granite cliffs extending vertically for hundreds of feet. And it was on and above this mountain that five or six pilots at a time would soar throughout the meet, consuming with the crags and rubbing wings with the birds and eagles.

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Soaring on the WEST COAST

California gliding reached new heights in popularity at the April Contest at Arvin.

By Charles F. McReynolds
West Coast Editor, AVIATION

SOARING is booming in new heights in this country if we may judge from results of the recent Third Annual Western Championship Soaring Contest held at Arvin, Cal., April 13-20. In spite of very weak soaring weather, notable performances were witnessed and the meet was comparable with America's national championship contests of a year or so ago. With 47 pilots flying in 26 different sailplanes there was constant activity throughout the nine days of the meet.

A total of 427 flights were made, with combined cross-country mileage of 3,172 miles, and a total flying time of 361 hours and 34 minutes. Greatest distance flown was 173 miles, which was made by two pilots: Woody Brown in the Justice Super Albatross, and John Robinson, flying the Hawk-Superflygite "Zander" gliding sailplane. These two Superflygite pilots also finished one-two in the point standing, with Woody Brown again winning the championship.



Take-off of the new Justice Superflygite sailplane.

Now that a mass market is here, engineers will produce a faster, more efficient light plane.

THE present market is fast becoming a center of attention as the new grass plans of criticism. When airplanes have been built which will make 30 miles per gallon and 80 miles per hour and can be flown with very little skill so far as operation is concerned, then, from the standpoint of the general public, the present-day plane will have arrived.

The problem of the light plane is not a simple one. Ninety per cent of the present-day planes today are selling on a price basis. While the public thinks of airplanes as something of artificial scope of travel, and while they can be used for long trips in the Florida Circle, most light plane owners will see their ships primarily for flights around their home ranges.

To even design a high-speed cross-country plane for this type of market today is questionable. That is, it is questionable if the market is there for fast speed and range in view of the lack of experience of most of these pilots. The present-day plane has come, so far, through the drudgery of carrying light and flying at each one's risk.

The strong contention is not going to be satisfied to live on two dimensions as have all previous generations but demands the third as part of his daily experience. He is just what is well satisfied with a 30-m.p.h. plane as he would be with a 100, and perhaps more so for this first stage—since flying fast per hour is so much cheaper for this class type, in whom a dollar this way or that means a great difference.

A vice-squaring of the owners of the late "poodle jumper" could not



"This is what I mean..."

TOMORROW'S LIGHT PLANE

will have three features, says

William B. Stout

President, First Engineering Laboratories

Continued from the leader

lower long cross-country trips as is proved by the Florida tour, in which many of us on the tour of this private and all, and yet haven't money enough to get home again after they lose a \$10 bet on the race. This, of course, is a factor in a lot of money and people of plenty of money who go on the Florida trip, but it is again to emphasize that a large percentage of the market, even today, is of enthusiasts with as yet no financial background, who are bound to the answer and whose very participation in flying on this basis indicates an

instinctive and driving ability that is bound to put them on my list. I emphasize this point, however, to show that to the present owner field today, even in the first fundamental form, safety has been compromised with in these designs, from the standpoint of safety, in order to obtain low cost.

It is not so difficult to design a new airplane, to make it fly, and to get an ATC as compared to the real difficulty of building a money market where this plane can sell in quantities large enough to enable the manufacturer

to make a good job within the price range.

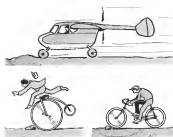
The late four-cylinder ships have hit a market and a large one. It is expected that 6,000 planes will be sold next year and at least 10,000 the year following, and that is a lot of airplanes.

It took the automobile industry twenty years before all designs looked alike, when at one time the industry developed that a price was instead of an engineering was.

Low and behold, however, the "poodle jumper" industry seems out by everyone copying the original design, so that except for a "wide wing here and a little less tail there, and a slightly different shape of cowling, all of these little ships look about the same.

The fact is, the cost of engineering a new design to meet the field is too high for a four-cylinder representative in light, and this business, like all other businesses, must stand on a close thing and grow a natural growth. Let's give every credit to the present, who have done a remarkable job to date. It is too early, however, to concentrate completely on production and design that the plane must grow better as the industry will stand up where the tri-motor business would go with loss of production and so on.

Already the number of ships sold has proved that the market for a ship under \$1,000 exists and the further below, the greater the market. However, plans of these planes are already making their eyes around for something better and yet they must have the same economy, approximately the same first cost, and greater performance. Present-day small planes may be looked at as the Model T design of the airplane field—cheap,



Early landing gear was more necessary in airplanes than on bicycles.

practical, and safe enough for present-day requirements.

We are now approaching a time, however, when a Model A would come out, with twice the traveling performance of the Model T. With present engine sizes it is perfectly possible to step up our existing speeds to 110 m.p.h. or more, yet with better landing facilities than today.

We must think of buying a transport plane with improved service, expanded landing gear, wooden propeller, and a landing behind the propeller two-thirds the diameter of that propeller.

One of the greatest mechanical demands of the present age is a fast propeller blowing against a big fan-blade.

These small planes, in flight, have so much wind against their own chest

that it is a wonder they don't wash out—and every bit of this drag is a penalty. The smaller the plane, the bigger is the leverage in proportion to the propeller, as seen on all the same size. Therefore, in a small ship it is going to be necessary either to arrange a rubber propeller with an all-propeller disk action in present, or else to go to even propellers and on the wheel.

Due to the small plane landing gear and maintain the wings to do away with the struts, and 13 m.p.h. extra speed is the available immediately. The percentage of gain of horsepower would be much higher than in the big ships, hence it is more necessary in these small ships to get more than the big ones.

So far as engines are concerned, our present cost and weight of engine, with what we have learned in the last two years, can just as well be a 70 hp job which again helps the owner, and while in it increasing the speed of the plane he is also increasing the miles per gallon.

The greatest danger, however, to present-day airplanes is not performance or cost, but unsoundness of design. The motor car driver needs to see only one plane and the present airplane driver, who sits under a wing with a big motor, could, in front of him, see planes in only one plane—the direction in which he is going.

A ship might be under him and he could not see it.

It might be over him and he could

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Most of the propeller area is involved in its small planes.



The volume of the propeller disc area is the volume of the propeller disc area.

THE LAW May Get You...

If you don't watch out. Here are some of the important legal points which you should know if you run an airport or a fixed-base operation.

By Solomon Rothfield
Member of the New York Bar

The common image of the life of an airport manager is an eventful one. Like the venerable legend of the lightning bolt, it is pictured as the eternal philosopher grappling with the moral ethics of life, wrestling his daily soap of duty, time to, and the port. But, unfortunately "The Law" refuses to share this picture. In fact, as a result of many different obligations placed upon him, the airport manager is being constantly swirled down with one and burdensome obligations.

It is the purpose of this article to summarize some of the obligations of an airport proprietor to the public in general, in specially eventful areas, to conduct meeting space, to protect an airport danger, to employees, to taxpayers and others either legally upon the premises or otherwise. Owners returned off the airport will not be considered here.

In dealing with airports, some courts have as often made a distinction between municipality owned airports and airports owned by private individuals or private corporate owners. This distinction is based on numerous precedents, a few of which will be mentioned later.

The American System of Law was originally derived from Old English Common Law. In order to protect the sovereignty of the King of England, the English Common Law introduced a hard and not reason that

the King can do no wrong, therefore, he could never be sued. Applying this same maxim, some courts have held that a state or municipality cannot be sued when engaged in a governmental function, but that the operation of an airport was a governmental function (189 S. E. 2d).

Other reasons for this governmental immunity have been given. Thus some courts have viewed a municipality of liability on the ground



Airport managers must provide some level of maintenance and protection to protect the public from accidents on the field and being injured.

that it would prevent excessive suits against the individual involved in operating the municipality, or that once the municipality gains no profit from the function it should not be liable, or that to hold the municipality liable would extend municipal employees in performing their duties, or that it is better to leave the individual who is damaged solely due to have the entire public suffer.

In fact in four states, statutes were passed specifically providing that a

municipal airport is exempt from liability. Iowa, North Dakota, Texas and Wisconsin have such statutes.

In the case of *Staple v. Jacksonville*, 141 So. 2d (Georgia) 1976, the court held that the plaintiff, who, while riding a motorcycle over a pavement at the airport, sustained severe injuries as a result of a bump in the pavement, which the airport should have known was a source of danger, could not recover from the municipality because the city was engaged in a governmental function and therefore was immune from liability. In this case the court who ruled on the statute specifically stating the airport was for a governmental purpose.

But a majority of state courts have held that a municipality operating an airport is engaged in a private enterprise and not a governmental function and for that reason is liable in damages for any injuries sustained by a third party as a result of the municipality's lack, just as any other private airport proprietor would have to be.

Thus in the case of *Rend v. New York City Airport Inc.* (New York



If an airport receives little or no profit, the airport manager may have to shoulder the blame. The court ruled he should have known the airport and have provided it.

1952) 259 N.Y.S. 2d, the plaintiff, an airplane pilot, sued his damage to his airplane (including while the pilot in landing struck a trash protruding work on the runway. The court ruled



Swamps are provided to be kept clear for airplane use. If the trash is left on the runway, the airport manager is responsible and the municipality is liable on the plaintiff's suit is clearly established.

that the ordinary law applicable to private owners of airports applied to a municipality operating an airport but ordered the plaintiff's recovery on the ground that the plaintiff was contributorily negligent.

In those states in which the courts have held municipalities liable for damages caused by their lack, the same obligations mentioned here are applicable equally to municipality owned airports.

The courts have imposed upon airport proprietors different degrees of



Airport proprietors must exercise due care, reasonable and prudent care to keep the premises in a safe condition for the use of planes.

care depending upon who is involved.

1. To the Police or Ground, the airport proprietor or manager must exercise ordinary, reasonable and prudent care to keep the premises in a safe condition for the activities and operations known or anticipated by him.

This duty or obligation is a broad one and covers considerable ground. Thus if the airport proprietor or his employees have knowledge that a certain part of the field is used by the public, that part of the field must be made safe. If the airport proprietor knows, or if he should as a reasonable man anticipate, the use by the public of this part of the field, he must repair any defects in that part of the field that might cause any damage to the public. If he sees these defects, they must be immediately repaired by him. Even if he did not see the defects and it was upon them that he exercised his duties as a reasonably careful manager, he would have discovered it, the airport proprietor is liable.

This duty is therefore an active one. The airport owner must actively anticipate any dangers. Furthermore, that class of people is usually unaccompanied with vehicles and therefore less aware of possible running dangers. But that means the duty of the airport proprietor is broader as to specially limited groups.

In *Madison v. City of Silver Spring*, 230 Md. 132 (1952), the defendant, a municipal airport owner, let a logging and horse were on the field

The plaintiff while using the field and carrying a child in her arms stepped over the logging wire. At that moment some strange party either caught on the wire or stepped in, thereby raising the height of the wire and caused the plaintiff to trip and suffer severe injuries. The court ruled that the defendant city operating the airport was subject to the same liability as a private airport owner. Thus it was for the jury to determine whether the defendant in permitting a logging wire on the field, exercising ordinary, reasonable and prudent care for a use of the field by the public it knew of or should have anticipated. In *St. Lawrence* (Iowa) 1976, the airport proprietor or manager must use reasonable and prudent care in keeping the facilities, lights, roads and approaches to the field, cockpit rooms, restaurants, buildings, etc. in a safe condition for the activities and operations known or anticipated by him.

To this class belongs the general public invited to use the airport for jet rides, for air stunts, for balloon ascensions and so forth.

Thus duty though in many ways similar to the duty owed to the public in general, in some ways broader because at such gatherings, as air shows, air races there are large crowds of people and often noisy



It is assumed by law that passengers are not to be responsible and the pilot is responsible and able to operate.

children. The airport proprietor must take such active precautions by warning barriers and announcements so that the people attending will not get lost where one can reasonably expect to anticipate any dangers. Furthermore, that class of people is usually unaccompanied with vehicles and therefore less aware of possible running dangers. But that means the duty of the airport proprietor is broader as to specially limited groups.

In *Brinkman v. James J. Palmer and Baltimore Air Terminal, Inc.*, 189 A. 263, a young jet rule his friends to an airfield at which an air show was advertised. Upon reaching



In a public trespass to building part of the airport and is liable to be held liable under its demands.

the airport the jet stepped in across a bounded road without warning, striking him to sleep. The boy was struck by a landing plane and was killed. His father immediately sued the airport owner and the jury who heard the entire action and the six air shows. The Court found that the plaintiff and owner were from the fact that the latter who managed the airport was liable on the ground that he owed a duty of making the premises of the airport safe and that he should as a prudent man have foreseen the danger and provided warnings, demonstrations and precautions.

In *Christopher v. City of El Paso*, 98 SW 2d 394, the plaintiff, a child of thirteen years of age, was injured at an air show as a result of a motorcycle driven through a burning fence, running into the plaintiff and causing severe injuries to the plaintiff. The plaintiff sued both the owner of the City of El Paso and the party who leased the entire airport and managed it. The court held that the city as a municipality was equally liable to the plaintiff and that it was the city which leased the entire airport, at the time of the hearing it had no reason to reasonably foresee the danger created here and was held not liable. The court ruled that the lesser should reasonably have foreseen this danger to the plaintiff and should have warned the spectators by closing rope lines and putting up warning signs, that the latter was liable for failing to adequately warn spectators and to see that spectators were in safe positions.

In *Phil v. New County Agricultural Society*, 161 A. 2. 50, 149 N.Y. 2d 320-1974, plaintiff, six years old, was watching an airplane race off at a County Fair. The owner while landing their plane from his cockpit, ran steps at the right wing striking plaintiff who was standing outside of a "cave" made for the airplane. The defendant claimed that sufficient space was left for the plane and further that pilot was not negligent.

(To be continued)



After outer wing panels, tail surfaces and propeller are lowered, both fuselage and section of engine are sprayed with anticorrosive paint. Turbine ship is sprayed and sealed. This spraying is also ground.



Wing root is covered with waterproof paper and edges are bonded with bond-laminated adhesive tape. This procedure is repeated on the all engine openings in forward fuselage then proceeding to any part of the interior of the ship.



A B-29 being hoisted by a crane over in England.

BOXING FOR EXPORT

A new branch of the aviation business has developed in recent months due to the war

By Howard J. Emerson

OUT of the war a new industry has developed—boxing airplanes for export. It is an industry that is seldom seen by the public, because it occupies that small gap between the factory door and rough sea voyage to many parts of the globe. This new industry is directed by aircraft engineers, assisted by a gang of skilled seamen, metal workers and a fleet of heavy-duty tugs.

It is an important business, because expensive airplanes that are to be subjected to the rolling and heaving of a storm-tossed ship must be handled as carefully as a cargo of priceless diamonds.

And it is a big business—in dollars, in tonnage, in military value. Export sales weigh more than the planes they carry, can cost nearly as much as a light airplane. But when millions of

dollars worth of brand new aircraft must reach its destination in perfect condition, every step in the boxing process is worth the time and effort required to do a good job.

Last year 1,211 airplanes, valued at \$66,356,736 were exported. The bulk of these airplanes were boxed before they were shipped, according to Robert Hart, of the Bert Shipping Corporation, whose firm handles about 80 per cent of aircraft shipping. The cost of this export boxing cannot be figured accurately as no manufacturers or boxing companies will release actual cost data, but it runs in a very sizable figure. With the large backlog of orders from foreign governments that are now on the books, export boxing for 1940 and 1941 should show a great increase.

But what is there that makes the product of this industry an "aircraft export case" instead of just another box? It seems to be that all-important demand of "weathering." One boxing concern in the East, Bode Brothers, Inc., has gone so far as to register the phrase "Engineered Export Cases." Fred George Dade, general manager, explained the requirement that go into aircraft export boxing: "We explain how it started:

"Not long ago there was wide differences between boxing an airplane and boxing machinery, or a plane except to make a larger box. But, in the last few years the great increase in the cost of aircraft, and the advent of all-metal construction, the need for expert nose engineering and expert



A B-29 being lowered in line of export case with tapes of sections partially completed. Tail has been already taped. Special tape is used to seal the main fuselage ship. This sturdy construction of the fuselage and engine.



Outer wing of a B-29 being boxed in steel structural case here which is then will be boxed to side of wing case. Channels are drilled with special bits located by battery. Wings must be handled with great care during export.



Propeller wing is a wing case, showing how structural elements are boxed in case. Machinery is left in case to maintain in flight case. An eight foot long by four foot wide. B-29 case.

weathering become necessary. We move into the present primarily to aircraft engineers, with the purpose of designing an export case that will protect the plane as well as cover it. We accomplish this by inserting the plane to the floor of the export case by means of special metal lugs in the wing and/or landing gear and at the tail—the main two or three points where the plane is designed to take

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A B-29 being boxed in Sweden. After plane is actually lowered in from ends and sides of boxes are sealed together. But do not mark the ship. Wheels are wrapped and strapped in clear. Tail box at rear contains specially wrapped main parts.



Outer wing section of a B-29 being supported in case by a rigid framework. Wings, section, fuselage, rubber elements and other small parts are wrapped and then wrapped in waterproof paper before being secured in boxwork.



AIRPORT Fire Fighting

Gas and snow extinguishers have many uses around modern airports where fires may cause great damage.

By C. L. GRIFFIN
Writer, Kefauver & Co.

TAKE a pound of gasoline a couple of feet long. Add a spark. Watch fire burn over lightly with a pound or two of carbon dioxide gas. Fire and carbon dioxide vanish in six seconds.

Or take a maintained pond of fuel, at a gasoline tank or overflow. Add spark as before. Watch up a hundred pounds of carbon dioxide and here on a real streamer. Ten to thirty seconds is usually enough.

This same gas that puts the fire in gopher穴 is recovered by even-tempered people to be the fastest-known fire extinguishing agent for flameless liquid and electrical fires. It is used by airports in a variety of forms, ranging from a two-high principal-type that handles like a sump-pump, to a 10-ton truck holding thousands of pounds. But regardless of form, the basic principle remains the same: an inert gas condensed in a steel cylinder.

For those who never studied the physics of fire, here's an explanation of how this cylinder-full of inert gas works. Sealed atmosphere has an oxygen content of 21 per cent. Gasoline requires at least a 17 per cent oxygen content to burn. Therefore it goes out the center in 14 per cent or less, the gasoline stops burning. Which is exactly what happens when you discharge a pound of carbon dioxide gas and snow over a blazing surface. Though it follows out of the

discharge nozzle at 330 deg. F., below zero, the gas functions by smothering rather than chilling.

Three-dimensional Action

Because most fires here in three dimensions, it naturally follows that an effective extinguishing agent must also be three-dimensional, or gaseous. Liquid agents, for example, are severely handicapped in fighting a running or pouring fire, or a fire having solid obstructions such as presented by an airplane motor or electrical equipment. And because fires often break out in such inaccessible and obstructed spots, such a discharge can be clear unless one has a custom extinguishing agent—which can penetrate in every crevice of a motor or follow a blinding stream up a hose.

Other advantages of carbon dioxide for airport use are that it can-

not splash and spread a liquid fire, it causes no mess or damage, and its speedy action helps reduce the public hazard. Furthermore, it is safe to use on fire in live electrical equipment, for it is impossible for the potential to ground through the body of the fire-fighter.

Fighting Gas Extruders

While no set rules for proper uses and location of carbon dioxide transporters can be laid down because of the difference in airport layouts, the presence of major airlines serves as a guide. For example, starting with the plane itself, TWA places one lightweight 4-ft. unit in each cabin and another in the pilot's compartment. Clamped on the landing stand is a 24-ft. cylinder. Another 20-pounder is carried on the gasoline dispensing truck. In the shops, one finds carbon dioxide tanks on the

engine fire stands, exhaust-out repair benches, welding department, and all ground well-being and larger wheeled units are spaced frequently around the aprons, hangars, and shops.

American Airlines follows a similar plan. In addition to their portable 2-ft. unit, it carries on main-roof hangers 40-lb. and a 15-ft. cylinder is affixed to the top of metal hangar platforms. Many airlines place 30-lb. and 4-ft. carbon dioxide cylinders alongside each plane during warm-up periods.

When airplane operations get up to the 40 to 100-ft. type, the extinguishers are equipped with wheels and handles for quick maneuvering. When still more capacity is required, airports can follow the lead of Floyd Bennett Field, which has several hundred pounds of this gas in cylinders mounted in a motorcycle color and mounted in a long hose. Such a set-up, one of the major motorcycle types available throughout the country, proves valuable a large amount of the gas to any part of a large airport, or even beyond it. Other types, such as tanks which are limited to carry or pulled by hand, are also used here and abroad.

The altitude in carbon dioxide is independent of content, as the 10-ton six-wheel truck such as the one developed for La Guardia Field and New airports by Walter Kidde & Company. This truck, which carries thousands of pounds of carbon dioxide, can, under the largest types of airport fires, and finds the contents of stationary cylinders through

(This is page 172)



One of the limited fire trucks in the country is this 10-ton model developed and built by Walter Kidde for use at La Guardia Field, in carrying thousands of pounds in stationary cylinders and in portable equipment and hose on top will reach areas distant from truck. Carrying tanks, hose, valves, cable and others out past of the equipment.



Many medium-sized airports cannot afford a special fire truck and use motorcycles with a side-mounted cylinder of extinguisher gas for quick mobility about a field. The hose can be run from the operator to work at some distance from the motor vehicle, which is of great advantage in fighting large fires on the field or in a hangar.



To speed action, shoulder tank, a pump bar of carbon gas a 15-ft. glass-type gas extinguisher in the primary body and during the engine warm-up period.



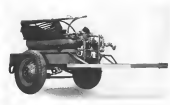
Reaper fires that may spread from gas also in motor as well as especially dangerous. Fire-fighting equipment should be kept close at hand and ready for use.



In the busy control tower at La Guardia Field are many carbon gas and other fire-fighting equipment. A 15-ft. carbon dioxide extinguisher is essential equipment.



Every landing stand at TWA places has a 20-ft. gas extinguisher which is used for maintenance use and not placed which passengers do not see.



A one-manual only truck on this has proved to be of much value and the cost to get built. It can be lowered inside of any car or truck. The six-lb. cylinder is carried inside, hundreds of pounds of carbon dioxide gas. The long hose and the discharge nozzle are vehicle forward. This two-wheel unit could be made in an airport shop.

Value Received from an ENGINEERING DEPARTMENT

For more important than your current working in your engineering department. It is the safest investment in your future. It may be your greatest asset in your most dangerous liability. Every manufacturer should study this exceptionally well worked out organization.



Roy L. Hibbard,
Chief Engineer,
Lockheed Aircraft Corporation

"WHAT do all these men do? And how do you know that they are doing it?" This is the question asked most as time by nearly every visitor to the engineering department. The answer involves a close study of each of the several groups doing different kinds of work within the organization of between 500 and 600 men. The master chart (Fig. 1) shows how the department is organized, who is directly responsible to whom, and, in further detail, how the type of work carried on in each group. Suppose we look at it for a moment, because it shows how group leaders are set up and how a small group of key men are able to bring back so many men doing so many different operations.

It is seen that the first man directly responsible to the chief engineer are J. E. Lewis, engineering manager; R. A. Perrine, chief project engineer; and C. L. Johnson, chief research engineer. Each of these men is a little king in his own province. Each is a working force in the department of a new airplane, yet each gets paid for only one group of men in their connection with the engineer and managers of the corporation.

The engineering manager is not responsible for the engineering of a new airplane. Rather, he is responsible for the new themselves. Operations of personnel, results of the men and of the work that the men do, are charged to him. It is up to him to

keep the wheels going "round. One of his chief assistants, W. R. Byers, is directly in charge of records of personnel, from which records, always kept right up to date, is determined whether a man is to be advanced in salary, given a position of greater or lesser responsibility, changed from one group to another, or advised to try some other type of work more suited to his particular talents.

Extensive work extended to help a new employee off on the right foot, or to offer one to keep ahead of new ideas in the engineering work, is carried out by men under the engineering manager. Groups under his have charge of the filing of accumulated records, books, and publications and other data; contact with Civil Aeronautics Authority representatives; service; standardization of new component parts used in the industry as a whole; material, the estimate of how many working engineering hours will be required to construct a new model, together with how many men will be required to work on each project for how many months, and how much the airplane will cost to construct.

The chief research engineer is the Galileo of the department. I do not know whether "Kitty" Johnson prefers a microscope or a crystal ball, but in either event he is living in the Land of Tomorrow. He and his men are constantly looking ahead. If they are not dreaming about a new airplane, they are testing out something already suggested, to see whether or not it will work and what adjustments

or improvements are required to make it safer, better or more economical to operate. They dwell in a world of aerodynamics, are ruled by the laws of physics, and have question marks at the heels.

Generally speaking, the chief project engineer's work begins where that of the chief research engineer ceases, at least off. E. A. Foxman rarely goes to work on a project until it has been thoroughly considered, tested and approved by "Kitty" Johnson. As this may have been indicated to him, and some preliminary investigations carried on in his department, but before any large force of men is turned loose upon a project it must have been given the green light of possibility by Johnson and the chief engineer. Many are also engaged in project engineering going to research engineering for approval there as something worth carrying out. Then, if it comes back approved to an invention idea project engineering carries a battery of men to work on it.

A great majority of the engineers work under Perrine. He has more separate groups doing different kinds of work than either Lewis or Johnson. Among those who fall in the class of project engineers or chief engineers are a dozen or more closely allied assistants to Perrine. Under these men are the stress engineers, weight control engineers, electrical engineers, dynamics, engineers assigned to design, control, landing gear, engine, power plant, instrument, landing gear, equipment, equipment, specifications and general research. The detail engineers, layout draughtsmen and design engineers are grouped under project engineering.

Solid Department Status					
ENGINEERING	DESIGN	RESEARCH	PROJECT	STRESS	TEST
CHIEF ENGINEER	CHIEF ENGINEER	CHIEF ENGINEER	CHIEF ENGINEER	CHIEF ENGINEER	CHIEF ENGINEER
ENGINEERING MANAGER	ENGINEERING MANAGER	ENGINEERING MANAGER	ENGINEERING MANAGER	ENGINEERING MANAGER	ENGINEERING MANAGER
CHIEF PROJECT ENGINEER	CHIEF PROJECT ENGINEER	CHIEF PROJECT ENGINEER	CHIEF PROJECT ENGINEER	CHIEF PROJECT ENGINEER	CHIEF PROJECT ENGINEER
CHIEF RESEARCH ENGINEER	CHIEF RESEARCH ENGINEER	CHIEF RESEARCH ENGINEER	CHIEF RESEARCH ENGINEER	CHIEF RESEARCH ENGINEER	CHIEF RESEARCH ENGINEER
CHIEF STRESS ENGINEER	CHIEF STRESS ENGINEER	CHIEF STRESS ENGINEER	CHIEF STRESS ENGINEER	CHIEF STRESS ENGINEER	CHIEF STRESS ENGINEER
CHIEF TEST ENGINEER	CHIEF TEST ENGINEER	CHIEF TEST ENGINEER	CHIEF TEST ENGINEER	CHIEF TEST ENGINEER	CHIEF TEST ENGINEER
CHIEF DESIGN ENGINEER	CHIEF DESIGN ENGINEER	CHIEF DESIGN ENGINEER	CHIEF DESIGN ENGINEER	CHIEF DESIGN ENGINEER	CHIEF DESIGN ENGINEER
CHIEF ELECTRICAL ENGINEER	CHIEF ELECTRICAL ENGINEER	CHIEF ELECTRICAL ENGINEER	CHIEF ELECTRICAL ENGINEER	CHIEF ELECTRICAL ENGINEER	CHIEF ELECTRICAL ENGINEER
CHIEF MECHANICAL ENGINEER	CHIEF MECHANICAL ENGINEER	CHIEF MECHANICAL ENGINEER	CHIEF MECHANICAL ENGINEER	CHIEF MECHANICAL ENGINEER	CHIEF MECHANICAL ENGINEER
CHIEF MATERIALS ENGINEER	CHIEF MATERIALS ENGINEER	CHIEF MATERIALS ENGINEER	CHIEF MATERIALS ENGINEER	CHIEF MATERIALS ENGINEER	CHIEF MATERIALS ENGINEER
CHIEF INSTRUMENT ENGINEER	CHIEF INSTRUMENT ENGINEER	CHIEF INSTRUMENT ENGINEER	CHIEF INSTRUMENT ENGINEER	CHIEF INSTRUMENT ENGINEER	CHIEF INSTRUMENT ENGINEER
CHIEF POWER PLANT ENGINEER	CHIEF POWER PLANT ENGINEER	CHIEF POWER PLANT ENGINEER	CHIEF POWER PLANT ENGINEER	CHIEF POWER PLANT ENGINEER	CHIEF POWER PLANT ENGINEER
CHIEF LANDING GEAR ENGINEER	CHIEF LANDING GEAR ENGINEER	CHIEF LANDING GEAR ENGINEER	CHIEF LANDING GEAR ENGINEER	CHIEF LANDING GEAR ENGINEER	CHIEF LANDING GEAR ENGINEER
CHIEF EQUIPMENT ENGINEER	CHIEF EQUIPMENT ENGINEER	CHIEF EQUIPMENT ENGINEER	CHIEF EQUIPMENT ENGINEER	CHIEF EQUIPMENT ENGINEER	CHIEF EQUIPMENT ENGINEER
CHIEF SPECIFICATIONS ENGINEER	CHIEF SPECIFICATIONS ENGINEER	CHIEF SPECIFICATIONS ENGINEER	CHIEF SPECIFICATIONS ENGINEER	CHIEF SPECIFICATIONS ENGINEER	CHIEF SPECIFICATIONS ENGINEER
CHIEF GENERAL RESEARCH ENGINEER	CHIEF GENERAL RESEARCH ENGINEER	CHIEF GENERAL RESEARCH ENGINEER	CHIEF GENERAL RESEARCH ENGINEER	CHIEF GENERAL RESEARCH ENGINEER	CHIEF GENERAL RESEARCH ENGINEER

FIG. 2

Not and dated by Roy L. Hibbard

Engineers are sent at regular intervals to ten facilities listed above

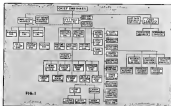
Where They Go

These 650 engineers have come to us from all parts of the country. Country to the belief of many, a university degree is not essential, but what we consider the employment of a man who did not graduate from college, we prefer that he has had experience elsewhere to be somewhat engineer. At a number of last, a certain percentage of our entire engineering personnel are not college graduates but those who aren't, because of practical experience, leave their business quiet as well as those who are.

We have more engineers from the University of Michigan than any other

university. At this writing, there are 46 men who attended engineering schools at the University of Pennsylvania at Ann Arbor. Other colleges or universities well represented include California Tech with 21, Massachusetts Institute of Technology with 22, University of California at Berkeley with 23, University of California at Los Angeles with 27, University of Michigan with 27, University of Washington with 16, Purdue, Illinois, and Colorado each with 15, Detroit with 12, and Stanford with 11.

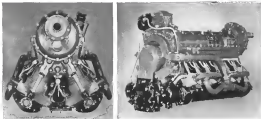
There are 46 from the Curtiss-Wright Technical School, 28 from Purdue Air College, 25 from the Frank Higgins Trade School of Los Angeles, (Time is June 1947)



Organization chart of engineering department, showing division of responsibilities.



A section of the Lockheed Engineering Department at Burbank, California.



Front view showing the crank bracket area

Three-quarter side view

New Ranger NAVY ENGINE

Model 5GV770B-7 has a take-off rating of 130 hp. available at sea level and 5,680 ft. with a low weight per horse power

By Jay P. Auwerter

ANNAE EBBR, Associate

CONCENTRATING on the objective of a 14hp-per-cylinder engine with low light weight and small frontal area the Ranger Engineering Corp. has completed development of a new twelve-cylinder in-line engine. The approval of this engine has made available for national defense an engine with two-thirds less frontal area than military engines of the same power. Being of the inverted "V", air-cooled design it has, in addition to the 130 hp. rating, a rating of 450 hp. at 12,000 ft.

Cylinder

Closely following the development of the engine has been the work on cylinder head cooling fins with the result that the new head has double the cooling area of the original head with

essentially the same overall dimensions. The cylinder heads are of cast aluminum alloy in which have been machined the hemispherical combustion chamber. Into the heads are shrink cast aluminum bronze intake valves and steel exhaust valves and the whole head is secured and shrink into the barrel. The cylinder barrels are machined from chrome molybdenum steel forgings, with fine nitroging, and have a 5 in. top flange into the cylinder head where the threaded tie. The barrel's seating is based on the diameter of the head and is secured to the lower half of the crank case by eight hold-down studs.

The intake and exhaust valves, one each per cylinder, are of the fully type forged from alloy steel. Exhaust valves of mushroom design, are exhaust filled, both at the head and

stem. The inlet ports open outward from each cylinder back and exhaust ports open downward in a "Y" between cylinder banks.

Full fork type pistons of forged aluminum alloy are used, ribbed for strength and cooling. Three compression rings and one oil ring are used between the piston pin and piston head, and one oil scraper ring at the bottom of the skirt. Piston pins are of heat-treated alloy steel, hardened and ground. The pins are full floating and are retained by snap rings in the piston.

Valve Operation

The camshafts are heat-treated alloy steel forgings, turned in housings which fit directly to the cylinder heads. Rockers and covers are of magnesium alloy, and each camshaft is supported on eight bearings, one located at each end of the shaft and one adjacent to each of the pairs of cams. Each camshaft is driven from a separate vertical drive shaft which takes its drive from the front end of the crankshaft. The covers are supported by roller arms which are provided with crowned-roller cam followers and ball type adjusting screws. The end of the adjusting screw is rigid and fitted with a hardened steel ball, the latter having a flat face which it is in contact with the end of the valve stem. From the hollow camshafts, pressure oil is fed directly to the crank bearing flange drilled in the camshaft bearings. Flange drilled in the camshaft bearings each pair of cams supply a spray of oil to roller arms, one follower and adjusting screws.

Crankcase

Cast light metal alloy is used for all crankcase sections. Upper and lower main sections are joined at the crankshaft center line. Both sections are ribbed for stress distribution, and are clamped together by long studs anchored in lower webs and extending entirely through upper webs and mainframes, the parting flange being held together by short studs. The accessory drive shaft is located in the lower section at the point of the V formed by cylinder banks. Four mounting feet are bolted to the crankcase, two located near the rear below the crankshaft center line and two located near the front above the crankshaft center line.

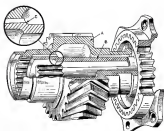
The front section carries the reduction gears, the gears for driving the accessory drive shaft and crankshaft, vertical drive shafts, and the constant speed drive. The rear section carries the driven for all accessories and the supercharger, to which the supercharger is bolted.

Crankshaft and Bearings

The four dampers which serve also as counter weights for the six-throw, seven-bearing crankshaft represent a departure from conventional aircraft engine practice. They effectively reduce the amplitudes of all vibration periods within the operating range to nominal values.



The balancing machine for dynamically balancing crankshafts has been developed by one of the engineers of the Ranger Engineering. The crankshaft is placed on rollers on a bearing assembly which is supported by four equal length rods from the frame of the machine. The shaft is then rotated at a speed in resonance within one of the bearing rods and any unbalance causes the shaft to vibrate. Since this vibration is 1/1000 inch maximum the deflection of the rods and the relative bearing the amount of each curve out of balance and this deflection diameter the weight is added or removed from the crankshaft. In the operation one end of the crankshaft is restrained while the other is free and can be balanced; then the system is reversed.



The spring washers on the split shaft "B" have been designed to substitute stress concentration when the bolts are under high loads. The rest of the bolt "B" has been sized above the other diameter of the split shaft and thus distributes the stress into the shaft over a larger surface rather than on a small area. If the rest of the bolt were as the same diameter as the split shaft, the bolts would shear them all at a tensile stress. The stress on the split and is increased directly to the crankshaft. The press is then mounted into the split shaft "B" line but the handlebars form "A" connect the split shaft. The handlebars pins, which for simplicity is not shown in detail, function pins in reduction pins.

New research equipment permits the quantitative and qualitative study of torsional vibration at all points along the crankshaft and propeller-shaft system, as well as per-

centage determination of both the optimum type and mass of damper required to suppress a given order of vibration and the influence of the selected damper design on all other orders and modes of torsional vibration.

Test results are typically presented as a distorted cross-hatched screen and show a linear representation of torsional vibration at sea level.

The crankshaft is dynamically balanced both before and after the installation of the dampers. Main journals and crank pins are hollow and fitted with oil plugs. These plugs are designed to separate sludge and foreign material from the oil, and also act as oil scavengers from the main journals to the crank pins. Crank pins are drilled for two-way feeding of oil from the main journal to crank pins. The rear end of the shaft carries the gear for the generator and shifter drives while the front end is splined to a split shaft through which the reduction gears in drive.

Reduction Gears

The reduction gears are of the bevel-type type, only two gears being used. A short split shaft provides the drive from the crankshaft, the front end of the split shaft also being provided with splines for driving the

(This is page 110)

AT
OHIO SEAMLESS



*Vigilance born
of Experience*
**GUARDS EVERY STEP
FROM BILLET TO
FINISHED TUBE . .**

By long experience we know that no step is unimportant in the manufacture of high quality seamless steel tubing. That is why we give each manufacturing operation to every detail.

Your interest in **OHIO SEAMLESS STEEL TUBING** quite naturally centers around the question of how it can serve you—meeting your most exacting specifications. That implies an interest in some of the basic reasons why, as well as how, **OHIO SEAMLESS** meets your requirements.

Avoiding technicalities and getting right down to brass tacks, we plan to present the story behind the making of **OHIO SEAMLESS STEEL TUBING** in a way that will answer those questions on both why and how. In the following months we will use this space to take you behind the scenes on a personally conducted tour. We believe you will find it both informative and interesting.

In the meantime we suggest that you consult our sales engineers on any steel tubing problem. They welcome the opportunity of being of service to you.



AVIATION
JUNE 1942

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Important recognition of the merits of the Bell *Aircobra* P-400 Interceptor Pursuit Airplane is found in its acceptance by the Anglo-French Purchasing Board. A quantity order has been placed to provide the Allies with the outstanding advantages of the *Aircobra's* striking power. As part of the United States air defense program, the Bell *Aircobra* P-39 is in production for the United States Army Air Corps.

BELL
AIRCRAFT CORPORATION
BUFFALO, N. Y., U. S. A.
"WINGS FOR THE CORPS"

*Also manufacturers of the P-40 twin engine Aircobra
Multi-Seater Fighter for the U. S. Army Air Corps.*

AVIATION
JUNE 1942
31

Republic EP-1 PURSUIT

With a cruising range of 750 miles at a speed of 290 miles an hour these ships may be destined to take an active part in the defense of Sweden

PROB is the German version of Norway the Republic Aviation Corporation delivered more than forty of their latest model EP-1 recently to Sweden. These airplanes conform to general design to the P-35 aircraft that have been promised to the Army Air Corps.

The EP-1 is a single-place, low-wing monoplane with an all metal monocoque fuselage. Armament includes two machine guns, mounted on the fuselage and synchronized to fire through the propeller, two machine guns mounted on the wings and firing explosive bullets, plus an automatic point battle situated in the lower

section of the wing.

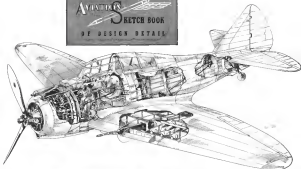
An outstanding feature incorporated in the wing is the integral tail fin, which is formed by the wing structure itself. The portion of the wing is made gas tight by the use of a special sealing compound and the structure in this area forms the end walls and the bulk plates, this being at the center panel. The outer wing structure consists of five main spars with fast and stiff ribs to give the necessary torsional rigidity. The flap is formed by splitting the trailing edge of the wing into upper and lower sections and deflexing the lower section downward. Operation of the flap is by

means of electric or manual control located in the cockpit. The hinge for the flap is a piano hinge.

The landing gear is approximately centered in cross section and the structure consists essentially of continuous longitudinal stringers with former ribs. The engine mount structure is carried over the structure by means of four main box sections



AVIATION
June 1941
21



longerons. Those carrying the upper main structure stringers extend from the forward part the cockpit, and in the member provide structural stiffening to the engine and the wing. The two lower longerons extend all only sufficiently far to distribute the reaction from the engine mount stringers into the fuselage structure.

The cockpit is completely enclosed by a sliding canopy which may be locked in any one of several operative positions. An emergency exit window in the canopy, and a druggable seat, allowing access to the baggage compartment with out through the baggage door, are provided for use in the event of a non-emergency.

The main landing gear is retractable, each by operating of a single electric motor capable of taking side loads

and landing. Fuel and oil tanks are taken by drag struts. Retraction is accomplished by means of the drag struts, which are connected by pistons to the oleo unit and to streamer blocks which slide on tracks in the wing. When in the retracted position, protection is provided for the event of an emergency landing with the wheels up, and landing loads are distributed through pads into the wing structure. The tail wheel is of the steerable type non-retracting with the roller and fully retractable in flight. The retraction is by the same mechanism as used to retract the landing gear, but is connected through a friction clutch, and in the event of the tail wheel sticking it will not affect the operation of the landing gear.

The stabilizer is a fixed structure

being attached to the fuselage at two points on each side. The structure consists of two spars meeting at the mid-point and being connected by ribs, the whole section being covered with wood.

The elevator is made of two halves hinged together at the point of symmetry, and hinged to the stabilizers through bell lever joints. A single control horn fully enclosed in the fuselage connects the two halves of the spar and in this manner permits any differential or relative motion.

The vertical stabilizer is of similar design to the horizontal stabilizer and is of all metal construction with metal covering. It is attached to the fuselage at two points and can be quickly removed for repair or replacement. The tail post carries the roller hinges which are provided with ball bearings.

The question of armament is becoming more and more vital at each day of the war progress. The EP-1 is designed to accommodate, and provisions are made for the installation of one .30 caliber and one .50 caliber machine gun, one on each side of the center line of the engine, with the changing fuselage accessible to the pilot for changing. Americanization horns are to receive 200 rounds of .30 caliber and 200 rounds of .50 caliber ammunition for these guns.

AVIATION
June 1941
22



Famous Firsts by Learadio

*LEAR AVIA risks no play for being "first" in giving you the aviation public's most numerous engineering achievements. The thrill of being first in class and expressing a solution in the most practical terms is reward enough for us. But for you, this thrill is much more the dependability of search radio, the reduced piloting of LEARADIO means a very definite—*even a GAINING*—importance! For it is your assurance that in using any current unit of LEARADIO means freedom, you enjoy the security and joy of knowing that here is embodied the most advanced principle and design that modern aviation can offer!*

FIRST radio receiver to serve the private pilot.
FIRST popular-priced aircraft transmitter.
FIRST commercial left-right direction finder.
FIRST multi-frequency direction finder (covering 100-400 Kc., 200-1200 Kc., 1200-2000 Kc., serving also as a communication receiver on these frequencies, plus the band of 2000 to 4750 Kc.).
FIRST self-acting hand-reel antenna.
FIRST retractable tele-lead with warning light and switch.
FIRST factory-made multi-frequency transmitter.
FIRST lowest cost small direction finder for light airplanes.
FIRST battery-operated portable range and broadcast receiver.
FIRST AC-DC and battery operated range and broadcast receiver.
FIRST dry battery operated direction transmitter.
FIRST commercial automatic direction finder.
FIRST fully automatic microphone (without relay).
FIRST locally controlled receiver with separate IF power pack (eliminating remote tuned shafts).
FIRST locally controlled transmitter with separate power pack.
FIRST locally controlled crystal stabilized receiver, transmitter, and direction finder (with plug-in crystal arrangements on panel).
FIRST transmitter and receiver tuning dial with continuously adjustable dual-control device.
FIRST commercial gyroscopic compensated instruments.
FIRST commercial automatic direction finder with graduated error converter at loop antenna.
FIRST automatic direction finder with: (1) slide-scale frequency tuning scale, (2) shutter-type band switch and dial, (3) automatic noise suppressor, (4) multiple indicator units, (5) loop motor at chassis, (6) removable side type ATE chassis, (7) automatic high low gain switch on loop, (8) Lear antenna "Fading meter and free whirling chain," (9) manually operated loop and remotely controlled chassis (no ever shooting due to motor inertia), (10) dynamic relay loop control system with Learcho propellant-free circuit.

Lear Avia, Inc., Dayton, Ohio

Branch Office: General Field: Wichita, L. S. & P. • San Antonio, Wichita, Kan. • Los Angeles-Walworth
 Chicago, Ingersoll, Ill. • S. W. • 1941 and 1942-43: Nashville, Tenn. S. W. & L. • Santa Monica, Cal. S. W.

AVIATION
 June 1940
 51



88%

of all transports ordered by U. S. airlines for 1940 delivery are Douglas DC-3s.

For 20 years Douglas' growth has continued space independent of general world conditions. Fruit of this growth is the undisputed leadership of Douglas in the air transport field.

70%

of all airplanes in U. S. airline service are the DC series built by Douglas.

69% of United States airlines fly airplanes built by Douglas.

IT PAYS TO FLY DOUGLAS

American Airlines MAINTENANCE at LA GUARDIA FIELD



With a Parker valve landing machines run on the Ford tubes internally and out.

A section of our shop showing hydraulic test stands in lower left and turbine and auxiliary departments at upper left. Engines and propellers ready for use are stored beyond partition at left. Shop is being overhauled at upper right.



Mechanic operating new cylinder head.



Turbine in hydraulic pressure regulator on hydraulic test stand.



New machine made by Helley Goss under the testing in one-day equipment.



Diesel-powered machine designed by A.A. engineers is test used maintenance.



Mechanic is testing a hydraulic pressure regulator valve on hydraulic test stand. This is a discharge view of test stand shown in close view on the opposite page.



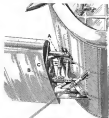
One of three engine test stands designed by American engineers for testing new engines before they are put in the service being after it has been overhauled.



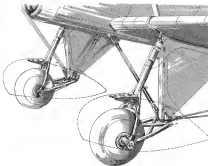
Most new test equipment is used. Mechanics in using electrical machinery test bench for testing turbine distributor valves and propeller de-icing pumps and more.

ATTENTION SKETCH BOOK
OF DESIGN DETAIL

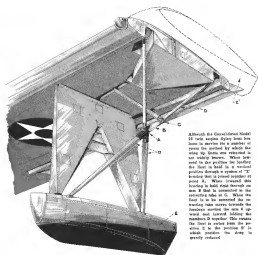
The shaft wings on either side of the Syme STMS handle are of welded steel tube construction, with metal connecting all the wing root, A and B are the members which take the loading upon the wing ends to the forelegs. The top control is through the leverage system at C coming from the cockpit and going to a control cable that passes the stress to the wing.



The Bygon KINE tractor has caused a great deal of interest in the construction as well as in its performance. A recent section (internal) of the magazine reveals the mechanisms, stressed steel type of construction used. Employed in another area used and some situations they bulldozers are used in places of DDT engines from the working. Complete dual controls with dual air brakes are installed. A torque tube mounted an aluminum alloy bearings connects the two shafts for drives, control and a push pull tube handle the torque tube provides the steering connection.



The headgear gear of the Ryan JHM-1 is of the track type with mechanically operated multiple disc brakes and long stroke rear and spring shock absorbers. The structure of the headgear gear is of built up welded tube sections over which is fastened a DMT Aerial Lifting. The intercompar motor behind the shock strut is fully covered. The shock strut is fastened to the fuselage through a hinge fitting the wall having single sliding through the use of abundant jigs which were first attached to the fuselage on one side and the wheels at the other. That of the headgear gear is plastic in nature.



Although the Conventional Model of wave propagation along bore lines involves the summation of waves scattered by each wave wing, there are situations in which the waves are reflected and widely known. When limited to the position by leading the flow is held in a vertical position through a system of "boreholes" that is joined together at point A. When forward this bearing is held open through one of the tubes that is connected to the reflecting tube at G. When the flow is so generated the reflecting tube serves towards the boreholes scattered the wave A upward and toward leading boreholes B and C. When the flow is held in a vertical position, the wave is scattered towards the deep in which position the flow is greatly reduced.

Louping off inside of the handle of the Model 22 shows the two aluminum running headwings and the bottomless running crosswings. The large ballheads in the row are the "basic" ballheads which attach up into the top of the aluminum. The ballhead does fit into a groove on the head while the two vertical wires in the background are the



The STEARMAN FAMILY NOW WELCOMES VENEZUELA



NOW across Venezuela . . . to take its place in the long line of nations whose flyers are trained in Stearman aircraft . . . to follow the example already set by the U. S. Army Air Corps, the U. S. Navy, the Brazilian Army Air Corps, the Cuban Army Air Corps, the Argentine Ministry of Marine and the Philippine Army Air Corps. In placing its order for Stearman Trainers, the Venezuelan Army was guided by the enviable record of Stearman in the field of primary and advanced training planes, all built in accordance with existing requirements of the U. S. Army and Navy. Now under construction in the spacious plant facilities of the Stearman Aircraft Division is the largest prior order for Stearman ever placed by the United States government. With these airplanes the Army is providing primary training for the new pilots who appear to fly such mighty machines of defense as the giant 4-engine Boeing Flying Fortress.

Boeing has always built tomorrow's airplanes today!

In the unusual photograph above are shown the redline streamlining markings of the U. S. Army Air Corps, the Brazilian Army Air Corps, the Cuban Army Air Corps, and the Venezuelan Army, as they appeared on Stearman Trainers recently delivered to these nations.



Stearman final assembly line

BOEING AIRCRAFT COMPANY
SEATTLE, WASHINGTON

BOEING

STEARMAN
AIRCRAFT DIVISION
WICHITA, KANSAS

PART III

WHEN scheduled airline operations were started in the United States, the Government established a teleprinter communication service to provide the necessary meteorological and associated ground communication. Weather and other necessary information is today disseminated over the major Federal airways system. Over 23,000 miles of telegraph line are leased for this purpose at a total cost of over \$750,000 annually. In an effort to reduce this cost and at the same time furnish additional and more reliable service, a multiple channel radio teleprinter and continuous voice communication system was developed.

Experiments were started in 1930 using a radio system utilizing a frequency of 281 megacycles, but this was unsuccessful because of high static levels occurring during the same radio band. In 1933 tests were conducted using the 3 to 4 megacycle band, thus the ground associated losses of noise, fading, and multipath propagation. In 1935 an experimental ground operating in the 60-66 megacycle band was installed with stations near Washington, D. C., and Baltimore, Md., a distance of 30 miles with the antennas approximately 400 feet below line of sight. The transmitters were crystal controlled and supplied approximately 800 watts of power to a directional antenna system. The antenna system, mounted on top of 125 foot steel towers, consisted of four horizontal one-half wavelength towers, spaced at right angles, was long vertically and in a plane with a similar array as a parabolic reflector. The receiving antenna also is a 125-foot steel tower with all the rhombic type, two wavelengths on a side. Directional sensitivity of the receiver was increased by increasing the steel towers in the radio frequency portions were used. The antenna component was developed to use standard telephone equipment and wire line procedures were conducted. Three years of successful experience of this system proved the reliability of the system and the desirability of using ultra-high frequencies with their low static level, freedom from sky waves and assurance of being for day point-to-point ground service. In 1939 a system was demonstrated in Washington which provided ground-to-aircraft teleprinter service in which the

UHF

These articles on which the aircraft are significant in frequency modulation makes its bid against other broadcast systems. No more has yet been seen to decrease criticism of the aird assignments, and this third article deals with Radio-telephone and Radiotelephone Ground-to-Ground, Ground-to-Aircraft.

By W. E. Jackson

Chief, Radio Development Section, C. & G.



Aircraft Radio-telephone Installation



Aircraft Radiotelephone Power

plot received printed copies of weather information and other communication data while in flight. At the present time, work is progressing rapidly on a program for the installation of a radiotelephone and telephone cross between Washington, D. C., and La Guardia Field. This will provide a ground-to-aircraft telephone channel, a ground-to-aircraft voice channel and two ground-to-aircraft channels. The installation will include two seasonal stations, four intermediate stations and one automatic repeater station with intermodulation and recording equipment operating unattended and will eventually replace the present wire line telephone system used for the collection of weather information and traffic control operations.

The crystal-controlled transmitter operating in the 60-66 megacycle band will furnish 200 watts of power to an antenna with its directional radiation characteristic consisting of four one-half wavelength antennas spaced in a plane and separated laterally, resembling in the vertical plane. Continuous operation of the crystal will be insured by providing duplicate transmitter with automatic changeover to the spare unit in case of failure of the main transmitter.

A single rhombic type receiving antenna will be used for transmitters receiving from these directions such as separate frequencies. Rhombic selective installations for the ends of the antenna will produce the same results with its directional radiation in a separate antenna system aimed to opposite directions. The transmitting and receiving antennas will be spaced on a single 280-foot steel tower. The topography between Washington and N. V. C. is such that with 200-foot towers line-of-sight conditions will exist in 60 to 66 miles against the crest of the station. A dual beam crystal-controlled receiver will be used for each frequency.

Each telephone channel will consist of two lines. Transmissions from north to south will use tone A, those from south to north use tone B. With this system, wire line problems can be easily avoided.

In conclusion it should be noted that the field of aeromarine has furnished the major stimuli to the development and application of ultra-high frequency radio. Reaching progress in the radio art has in turn made available valuable aids in the advancement of the flying art.

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Spartan's Radio School

By Maxwell W. Balfour
Director, Spartan School of Aeronautics

AN important personnel shortage in aviation today is due to the lack of trained radio technicians. Let's face employment managers of airlines, airports, manufacturers and the government all tell the same story, "We need men who know aviation radio."

Spartan School of Aeronautics, of Tulsa, Okla., recognizes the inevitable shortage of radio men four years ago when it opened its first course in radio work. George Waller, with twenty years of experience behind him, supervises the department. He had not been at the school long before word

was spread through the Middle West that Spartan had a well-equipped shop and could be prevailed upon to do radio service work. Harold Askins, now McCombs, brought in its radio men for overhaul. Thus private plans began taking for help and gradually the radio shop became busy with service work and observed government approval.

Radio students also get practical experience in the handling of sets. A number of transmitters have been built at the school that have a sending range of 1,000 miles for use in both single and multi-motored ships.



In radio code class students learn to handle code in more efficient standards.

The latest project has been the development of a light, one-way radiotelephone set for small private planes.

The start of the radio shop and the amount of special equipment has grown steadily. More than \$25,000 worth of radio equipment for student use is now on hand. This includes a 500-watt telephone and radio transmitter, ultra-high frequency phone transmitter and for transmitting instructions to pilot students during refinery solo flights, and the latest type instant-tube communication receiver equipped with heat resistor and crystal filter for code reception. This receiver enables radio students to learn how to operate the type used by the major airlines. Another receiver constructed by the Spartan School laboratory is used especially for receiving the stage and weather forecasts. In one of the modern classrooms are two tables equipped with telegraph keys and auto-transmitter for only instruction.

For test work there is a powered transceiver, a milliwattmeter for delicate adjustments in frequency, a frequency meter and is synchronized with the

(Time to page 132)



MODERN

LIFE in the MISSISSIPPI

CHICAGO & SOUTHERN INTRODUCES
NEW DOUGLAS DC-3's WITH
1200 h.p. WRIGHT CYCLONE ENGINES



NOT so many years ago, feasts of the famous river paddlers made folk-lore along the great Mississippi, and Mark Twain, himself a river pilot, wrote this stirring era into the country's literature. Today the basis of a new chapter in Mississippi history is being provided by the Chicago and Southern airlines which follow "The Valley Level Route" above the majestic Father of Waters.

Chicago and Southern's joint contribution to modern life on the Mississippi is a new fleet of Douglas DC-3's now in operation between Chicago

and New Orleans. Powered with 1200 h.p. Wright G-200 Cyclones—the most powerful of the single-row Cyclone series—these luxury ships bring a new conception of speed and performance. Service by attractive stewardesses provides a degree of comfort unheard of in Mark Twain's day.

Chicago and Southern Airlines, long a user of Wright Warbirds in its fleet of Lockheed Electras, now joins the growing list of Cyclone operators who have given this engine an unsurpassed record in the transportation field.

WRIGHT AERONAUTICAL CORPORATION - A Division of Goodyear-Wright Corporation - PATTERSON, NEW JERSEY



Students get practical instruction in new instruments with radio shield students, under skilled working conditions.



Instructor George Waller, right, gives a lesson in transmitter receiver work.

AVIATION
June 1940
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WRIGHT *Aircraft* ENGINES

LEAD AND SAND



The photographs show lead bars and sand bags piled in keeping the wings of a BEECHCRAFT lightest aircraft, in its intended position, in a stress test testing rig.

The purpose of this test is to determine if the aircraft will stand up to the stresses of a crash landing. What makes this test unusual is that the wings under test are more than 40 months old.

The purpose of the test was to determine if protective barriers and materials used in BEECHCRAFT structures would prove true to retain their originally designed strength over a period of years.

To a continuous period of more than four hours the

designed, ultimate breaking stresses were imposed on these wings. Further weights were added until the stresses were 100% of actual full load flight stresses. This was equivalent to a "dry pull out." No loadings occurred. When the weights were removed the wings were inspected and carefully inspected. All parts were still solid and in their proper places and no signs of damage could be found.

This sort of testing is expensive, but proves beyond a shadow of a doubt that BEECHCRAFTS are built to meet testing safety and trouble-free operation.

8422 EAST CENTRAL AVENUE • WICHITA, KANSAS, U. S. A.

BEECH AIRCRAFT CORPORATION

THE LASTING OVERSEER OF ALL BEECHCRAFTS IS
 BEECHCRAFT AIRCRAFT CORPORATION—INC.
 BEECHCRAFTS DEMAND FOR A DEMONSTRATION

AVIATION
 June 1947
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BIG H-P-M PRESS PRODUCES THOUSANDS OF AIRCRAFT PARTS • • •



This 3000 ton H-P-M Press has ample power and area for forming large aircraft parts by the accepted methods, as well as numerous small parts in multiple. • Although H-P-M has built the largest aircraft press in operation in the United States, it recommends this standard 3000 ton press for average routine work. • Today since of these H-P-M Presses are proving advantages and opening advantages. Write for complete information today.



FASTRVERSE PRESSES

with their exclusive CLOSED CIRCUIT system

THE HYDRAULIC PRESS MANUFACTURING COMPANY, Mount Pleasant, Ohio, U. S. A.
 District Sales Offices: New York, Syracuse, Detroit and Chicago
 Representatives: Boston, Worcester, Hartford, Providence, Cleveland, Cincinnati, Flint, Toledo
 San Francisco, Los Angeles • Foreign Representatives: Canada, England, France and Holland

PESCO PRODUCTS *help the pilot take his ship "Upstairs"*



Announcing a NEW DRY AIR PUMP

Out of the PESCO engineering laboratory comes this new Dry Air Pump featuring these unusual advantages:

- Delivers CO-FREE air to Se-locs
- Eliminates oil from Se-loc boots
- Extends life of Se-loc boots
- Requires no oil separator
- Provides vacuum for light instruments



• CO-free air discharge is achieved by a special design whereby carbon tank is vented back into air stream.

• As the pilot of this new Chicago & Southern DC-3 opens his throttle for the climb, he is secure in the knowledge that PESCO fuel pumps and accessories are performing with their customary dependability. Proper fuel delivery is of utmost importance as the great transport goes "upstairs."

Other PESCO Products at work during this crucial period in the flight are Vacuum Pump actuating light instruments and Hydraulic Pumps recharging landing gear

PUMP ENGINEERING SERVICE CORPORATION
DIVISION ARMO RUBENSON CORPORATION
12313 TAFT AVENUE CLEVELAND, OHIO, U. S. A.



AVIATION
June 1949
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Southwest Aviation Conference

Successful meeting at Tulsa provides new impetus to aviation growth.

TYPIFYING the tremendous interest in aviation affairs which is now sweeping the country, the third annual Southwest Aviation Conference held in Tulsa late in April was far more successful than either of the earlier conferences. Aviation officials representing all branches of both civil and military aviation as well as many persons from outside the industry, journeyed to Tulsa for the three-day meeting.

More planned below played a prominent part in the meetings. W. G.

Steffy was elected president, succeeding Moss Patterson who has handled affairs up well in the past. Bill Steffy has had a wide experience in aeronautical work as he is president of Spartan Aircraft School and is head of the oil company bearing his name.

Among the Conference recommendations was that if Congress were authorized funds for new research laboratories, the labs should be located in the interior sections of the country. Congress was petitioned to

approve the McGarran and Skelton bills for additional airport construction. Sessions and demonstrations from the Southwest were petitioned to back new trade laws for their sections of the country.

CNA was urged to divert the present teletype weather information service in favor of a group collection service such as was used prior to last November. Members of the conference agreed to work for the establishment of additional airports and repair facilities in the Southwest.



ENGLINGER



SKELLY



PATTERSON



WESTBY

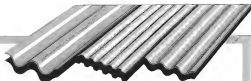


GREEN



MOORE

AVIATION
June 1949
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NEW WRINKLES

AND WHAT THEY MEAN

Moving as it moves. With new, more powerful equipment now being installed, it will be possible to produce Alcoa Aluminum Alloy corrugated sheets in a variety of forms previously unavailable. Sheets of stronger alloys, larger size, greater thickness and deeper corrugations may be made. The same equipment will also be capable of forming sheet into special shapes such as channels and angles.

Moving for aircraft design. With this new larger, stronger, and thicker Alcoa Aluminum corrugated sheet, it will be possible to make improvements in aircraft design which bring advantages both to manufacturer and to operator.

And a Major Moving. A lot of money went into development, design, and building of these corrugating machines. This expenditure follows a policy, and a program. The policy is a broad one of exploring every new avenue of usefulness for Aluminum. The program is to provide plant equipment to keep the production of Alcoa Aluminum Alloys a step ahead of the normal needs of dynamic, progressing industry. It's a matter of doing everything possible to give you Aluminum in the forms you need for the best aircraft that can be made. ALUMINUM COMPANY OF AMERICA, 2182 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA  ALUMINUM

AVIATION
June 1960
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RESEARCH



NORTH AMERICAN AVIATION, INC.
INGLEWOOD, CALIFORNIA, U.S.A.



BUYER'S LOG BOOK

What's New in Accessories, Materials, Supplies and Equipment

A system to help the operation of engines at more stable temperatures and to help increase thrusting range conditions has been developed by the Ford Development Corporation of New York, New York. Two versions of this product, called "Avalon" have been developed. Number 4 is for direct running with gasoline and is used principally for racing purposes while number 3 is used with a carburetor valve for automatically raising the intake valve of gasoline for take-off and de-lagging (slow-down). This valve so controls the flow of Avalon that the quantity is increased with the output of the engine without any attention from the pilot.—*AVIATION, June, 1940.*

General adoption of dual-type counterbore rivets by the aircraft industry has made rapid and accurate counterboring of rivet holes an important operation. Points have been applied for by Aircraft Tools, Inc., Los Angeles aircraft tool manufacturer, on an entirely new step counterbore for use with an electric drill. The tool is exceptionally sturdy and fast in operation because of manipulation of full ball bearing mounting of the counterbore head. This counterbore can be widened for depth to within .005 in. and drag locked in position. Adjustment is quickly made by hand. Carries an three-fold high speed steel, ground for correct cutting edge, with reversible pilot. Accessibility is held to within .001 in.—*AVIATION, June, 1940.*

Increasing use of arc welding in aircraft construction has renewed interest in this process among aviation people. Latest "speed-up" device applied to arc welding is the new Wilson remote control device used with the Wilson "Hawes" Arc Welder, manufactured by the Wilson Welder and Metal Co., Inc., New York, N. Y. To use this device the hand-held switch governs the control pole of the standard welder is replaced by a reversible electric motor control. Minute adjustments in current output can be effected by touching one of two contacts on the electrode holder to the ground. When the holder button marked "more" is touched to the floor the output is increased. When the button marked "less" is grounded the output is reduced. An automatic slip clutch and stops protect the motor mechanism.—*AVIATION, June, 1940.*

Despite the wide adoption of roller head reinforcing machines to accurately sheet metal profiling operations, there is still a large field for the good old rolling machine. Not only is such equipment used as many as the roller plates, but wherever simple rollers must be profiled on but a few parts the roller is an element. Former builder of rolling equipment, the W. J. Stevens Company of Kew-Forest, Tenn., has recently incorporated numerous refinements in its latest line of rollers. Built as casting dies in mild steel up to 2 in. thickness, and with closed depths up to 36 in., Stevens rollers have a direct-over-center-stance and patented tool holder which makes it possible to cut stainless and other alloy steels, as well as the lightest alloys.—*AVIATION, June, 1940.*

With aircraft features expanded to the point where it is necessary to use roller plates to remove these one part of the plate is another there is reason for special interest in the new Goss Flexible Printer announced by the Goss Corporation of Johnson City, New York. This little printer will reproduce engineering drawings, letters, reports, maps, or any pencil or ball pen, typewriter or printed matter appearing on but one side of a reasonably translucent sheet of paper. A dry developing chamber, located behind the metal reflector, utilizes the heat generated by the lights to evaporate the developing agent. The set is light and portable so that it may be carried from place to place for use in various offices or departments of the factory.—*AVIATION, June, 1940.*

Flange-type overalls with a minimum of friction and wear, resulting in reduced cable maintenance, are utilized for the new SKF roller bearings manufactured by SKF Industries, Inc., Philadelphia, Penn. These AV standard bearings are supplied in three types, the deep groove ball bearing, the self-aligning



Avalon automatic mixing valve.



Power counterbore.



Wilson "Hawes" arc welder.



Stevens rolling machine.



Goss Flexible Printer.



SKF roller bearing.



Dual-type counterbore.



Accurate electric hydraulic valve.

ball bearing, and the cylindrical roller bearing. All are of the full type, employing the maximum number of balls or rollers without overlap, providing high loads with maximum weight. Two dustproof covers (optional) in the bearing. Shims of a lightweight plastic impregnated fabric, or of aluminum alloy, are available.—*AVIATION, June, 1940.*

An aircraft gear more complex in its operating action of study and engineering must go into their various actuating systems. Electric relays have played an important part in making practicable means control actuating of various devices such as retractable wings and landing gear. Now a memory relay utilizing the ultra-thin metal body of the DuPont memory relay, and the displacement principle with aluminum actuation has been developed by DuPont, Inc., Elkhart, Indiana. The relay is hermetically sealed, may be operated up to 200 times per minute, has very little friction or wear in operation, is of compact and rugged construction, requires little or maintenance — in fact, it's a good relay. On A.C. current as little as 1 volt is required for normal closing operation and only 1.5 volts for normal opening operation. On D.C. the operating energy required is but .25 watt.—*AVIATION, June, 1940.*

Possibilities of remote electrical control of hydraulic valves on aircraft hydraulic systems are illustrated by the operation of the Aeromec of Illinois valve developed by the Aeromec Manufacturing Corporation, Bensenville, N. Y. Operated by an electric solenoid, this valve was designed for directing engines of all aviation engines, to some in cold weather starting. The valve is light, rugged and efficient. Tests have been run in its excess of 20,000 cycles under 50 lbs. per sq. in. pressure without evidence of wear or leakage. Secondary operation has also been obtained at pressures up to 500 lbs. per sq. in., and the valve has proved tight against oil, gasoline, and glycol.—*AVIATION, June, 1940.*

Application of the electric starter to the automobile is said to have done more than anything else to popularize that vehicle. Lightplanes are still started by hand cranking the propeller, an awkward and somewhat dangerous operation. Development of reliable electric starters for lightplanes has been slow because of cost and weight, but it may be that a mechanical starter controlling the pilot to spin his motor from the use of the plane will do much to solve this lightplane starting problem. Such a starter is now being offered by Auto Starters of Pittsburgh, Penna. The device is quite simple in design, consisting of a cylinder and lever with a propeller shaft. A soft wire extends back into the cylinder penetrating the pilot to spin the engine manually without inconvenience or danger.—*AVIATION, June, 1940.*

Light weight, wind driven generators, at prices within reach of all lightplane owners, have been introduced by Chicago Aerotec Products Company, Los Angeles, Calif. Several models are available in 6, 12, and 20 ampere capacity, weighing 6, 9, and 13 lb., respectively. The 10-volt models are available in 4, 6, and 12 ampere sizes, and weigh the same as the corresponding 6-volt models. Voltage, current and relay pressure overloads can, on the four-volt models, the propeller shaft can be adjusted to give maximum output under all varieties of existing speeds.—*AVIATION, June, 1940.*

(See page 420 for Window Shopping)



New lightplane engine starters.

AVIATION

June 1940

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AVIATION

June 1940

75



MICRO SWITCH

... A Boon to the Aircraft Industry



Micro Switches are used as up and down position indicators and as limit or limit/stop points. Limit switches on wing flap controls indicate flap up and landing gear, and on emergency control.

Micro Switches are used as normal push buttons, as automatic fire reset push-ins, as circuit indicators to show and for time on motor operated variable push pullbars, and wing flaps.

Micro Switches are used as push buttons, as push supply and oil pressure switches.

Now Being Used by Leading Aircraft Builders

Small size: 1 1/8" x 27/32" x 1 1/4". Weight 1 oz., without special mounting, switches or housings. Range requirements: 250 to 2000 cycles/min. Unaffected by temperature and altitude. Available with motion protected or momentary plungers, close or wide differential movement. Resists vibration, moisture "75-0" test. Operates in any position. Full and positive operation. Accepts standard screw terminals. Also available in metal housings.

Leading aircraft builders' use for Micro Switches has grown rapidly during the past few years. Many switches are used on such place as functional points where continuity of performance is a "must."

Micro Switches were adapted for use on airplanes after having been thoroughly proved in a wide variety of industries where over a million Micro Switches are now dependent upon for long life protection.

Aircraft engineers recognize that, in addition to the performance record of Micro Switches, they possess other characteristics vital to successful aircraft use—small size, light weight, accurate repetition of the point of operation; resistance to vibration; independence of position; and a versatile variety of possible adjustments and characteristics.

The illustrations show typical uses of the places Micro Switches are now used. Many more applications are on the drawing boards, and in engineering plans. For reasons which the photos at the left will make clear to every aviation engineer.

Micro Switch engineers are skilled and experienced in the solution of precise switch applications. Their knowledge and assistance are available.

MICRO SWITCH

Manufactured in FREEPORT, Illinois, by Micro Switch Corporation. Sales Offices New York, Chicago, Boston

AVIATION
June 1949
95

Patented 1940, Micro Switch Corporation



High Military Efficiency

IN RAPID MASS PRODUCTION

Now meeting across America's largest aircraft assembly floor in a production speed hitherto contained in the building of large military aircraft, the Martin Bomber Model 107W is a complete of aeronautical engineering. Combining maneuverability, speed, and fire power in a high degree, not designed specifically for rapid mass production, this new bomber assembly plant now is available for export.

THE GLENN L. NAYLOR COMPANY, BALTIMORE, MARYLAND, U. S. A.

MEMBER OF DEFENSE AND AERIAL INDUSTRIES



1949

"Dependable as a Watchdog!"



Illustrated is the Lycoming Grand 27 horse power engine. Other models are 25, 31 and 35 horsepower. They are all four-cylinder, horizontally opposed, air-cooled—much more choice of make single or dual engine ignition.

DEPENDABILITY is the foundation upon which all aircraft engines should be built. And throughout the aviation world Lycoming light-plane engines have become a standard by which to measure dependability. A broad background of experience in the manufacture of engines for military, airline and commercial use is reflected in Lycoming light-plane engines . . . practically designed, skillfully engineered and precisely built to the highest standards of construction. No wonder experienced pilots tell you that Lycoming is "dependable as a watchdog"—just as they say it is "smooth as satin" . . . "quick as a cat" . . . "thrifty as a Scotchman" . . . "quiet as a mouse"! Performance as brilliant as a star is readily verified behind a Lycoming engine in a Taylorcraft, Acrona, Piper Cub or Lascombe.

SEND FOR FREE LITERATURE: Illustrated folders on Lycoming light-plane engines may be obtained from all Taylorcraft, Acrona, Piper Cub or Lascombe dealers. Or write Department A-70, Lycoming Division, Aviation Manufacturing Corporation, Williamsport, Pennsylvania, U. S. A. . . Cable address: Aviatison.

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THE AVIATION NEWS

REVIEW COMMENT FORECAST

BLANKS STUMBLEFIELD

C. F. McKeown, Pacific Coast
J. P. McKeown, New York
L. E. Larkin, New York

JUNE 1948

FDR Wants Army Navy Airforce of 50,000

(Story on page 82)



Government Supply Photo

Public Domain

AS GERMANY CONTINUED to fight the Allies, President asked Congress for a billion dollars in addition to the \$100 million appropriated for 1947, to expand our defenses. Plus training will be increased overseas and more airplanes will be authorized for the Army and Navy. Secretary Charles E. Wilson made headlines by saying officially what had already been said unofficially, that airplanes have a "temporary" advantage over warships, which should be redesigned for protection. Franklin Roosevelt won his fight for transfer of the Civil Aeronautics Authority to the Department of Commerce, deemed to be a British Bristol-Beecher, said to be the fastest two-engine bomber in the world, which was heavy tail of B-24 planes over the low countries. It is the Jack-in-the-box of the RAF, it said the very strong bombing, strategic bombing and general reconnaissance. The war in Europe recently brought out gas tanks that are self-sealing against bullets. (Right) you see such a tank being exploded at the Quoniam Marine plant after it had been shot through. In addition to the pressure-proof gas tanks, future production for the Air Corps will be required with various types of gas-proof explosives shells instead of bullets, with heavier machine guns, and with armor which will protect personnel and engines.



Yankee Gentleman

The New England Aviation Conference, sponsored by the six provinces, was held May 17 and 18 under the Chaperonage of Halsey L. Williams, aviation executive and consulting engineer. The purpose of the conference was to coordinate the positions of aircraft and engine manufacturers with those of the manufacturers of parts and materials. Equipment problems were discussed and the proportion of air travel in the region was emphasized.

Besting of Newark

Defeat of Newark airport action against toward international airport with Brewster Aircraft Corporation signing new four-engine biplane and an option on 10 others. Opposition will not interfere with airport activity, say municipal officials.

D.C. Airport Opening

Congress opening Washington airport are due for Labor Day with President Roosevelt's thinking. CAA plans to move to when the buildings are ready, but to definite time is not. Construction are being considered to increase earnings.

No agency is put designated to run the RAA. Federal government can't, because it has no jurisdiction, that character is private. Only private operator agency permitted in the District of Columbia. As a consequence, responsibility, money and state D.C. would do it.

Shell Schoolships

Shell Aviation Schoolships this year go to the three outstanding U. S. civilian pilots, seven civilian contract airplanes (one three Shell civilian schoolships) in Washington when July 18. Schoolships owned in CAA testing program, his ability to handle airplanes, and general aptitude given his status. First place prize \$10,000 for the best student, second place \$5,000 and third \$2,500, for some kind of study.

Photographing Farmers

Agricultural Experiment Station, University of California, is photographing 400,000/194 for aerial photography of 100,000 square miles in western states. New techniques in aerial photography, says the AEA, make possible more satisfactory pictures and in return for the work which includes photography.

regiment of many sections. AAA anti-aircraft photography is most recommended and several methods of determining performance to come under any control.

Calling Names

John P. Fisher, chief of staff of the U. S. Army, has been named as the new head of the Army's new Air Corps. Fisher, who is now in charge of the Air Corps, will be in charge of the new Air Corps. Fisher, who is now in charge of the Air Corps, will be in charge of the new Air Corps.

J. J. O'Donnell, chief of staff of the U. S. Army, has been named as the new head of the Army's new Air Corps. O'Donnell, who is now in charge of the Air Corps, will be in charge of the new Air Corps.

John P. Fisher, chief of staff of the U. S. Army, has been named as the new head of the Army's new Air Corps. Fisher, who is now in charge of the Air Corps, will be in charge of the new Air Corps.

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DEFENSE

President Asks Bill for Defense

Calls for 50,000 Army, Navy Planes

After months of almost complete inactivity in the defense program, the President has today asked Congress to authorize a large increase in the production of aircraft and other defense equipment. The President's request is for 50,000 Army and Navy planes, and for 10,000 Navy ships. The President's request is for 50,000 Army and Navy planes, and for 10,000 Navy ships.

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**IRVIN
AIR CHUTES**
have saved
over 3000 lives

Alplane Spotter

The Department announced a new method for spotting aircraft in the air. The new method is based on the use of a special type of camera which can take pictures of aircraft from a distance of 100 miles. The new method is based on the use of a special type of camera which can take pictures of aircraft from a distance of 100 miles.

Reelot Tests

An extensive model research program is being conducted at the California Institute of Technology under the direction of Dr. Theodore von Karman. The program is being conducted at the California Institute of Technology under the direction of Dr. Theodore von Karman.

AVIATION PEOPLE



NEW PRESIDENT of United Aircraft Corp. is its former senior vice-president, Eugene E. Wilson. Mr. Wilson has been with United since 1935, and has been in charge of many of the company's various manufacturing activities. He is a member of the Institute of the Aeronautical Sciences.



RAYMOND F. WALSH, former general manager of Hamilton Standard, Springfield, division, succeeds E. E. Wilson as vice-president of United Aircraft. Rejoining from the Air Corps in 1919, Major Walsh was associated with Hamilton for two years, joining Hamilton Standard in 1935.



HARD WORKING Charles R. Greisdorf, superintendent of the division of air mail in the Post Office Department, joins United Air Lines as director of mail mail express. During the 20 years he has served the Department, he has won the great will of his associates and the industry.



CLIFFORD J. LEISY has been named chief project engineer for Vega Airplane Co., in exclusive work with Glenn L. Martin Co. Leisy was in staff engineer's level with Wright-Lewis Aircraft as assistant chief engineer in 1930; joined Kelsey in 1931; returned to Wright in 1933.



BARNETTE G. BAILEY of military aviator in Coast, Navy and Army. He has just managed the 1940 National Aviation Forum's show at Bolling Field in complete success. Last February he stood on Army air show at Bolling for the benefit of Congress.



NAVY PILOT Brian G. Forsyth, new vice president of the flight research department of Bell Aircraft Corp. Mr. Forsyth has accomplished four Pan-American trans-oceanic services and was test pilot engineer for NACA. Bell has a Navy version of the Mustang.



STEPHEN ACKER, director and engineer of Boeing's Twin Annual National Air Carnival, took away from the June 1 and 2 for his 10th anniversary in making the show the usual success. When not supervising this annual event, Acker efficiently manages Boeing's Airport.



DYNAMIC BILL REDDING, Washington representative of the City of Denver and treasurer of the NAA, has been successful in bringing to Denver NAA's annual exhibition July 7 to 9. He plans for the first time to combine thorough air show, staged by the city's Air Corps, July 8 to 9.

For a safety factor of **TEN** Republic ENDURO Stainless and Heat-Resisting Steels



● When this new Buick Trainer was designed, the engineers were required to draw up specifications for a safety factor of 10 instead of the usual 7.

This airplane, now in production, used Republic ENDURO® Stainless Steel for firewall construction—after finding by experiment and experience that it met fully the rigid requirements.

Airplane manufacturers today are using more and more Republic ENDURO Stainless Steel in a wide range of applications—exhaust stacks, collector rings, tail assemblies, instrument panels, pontoons and tanks. For each individual type of application there is a suitable ENDURO analysis—to resist corrosion or maintain strength at elevated temperatures—to withstand the unusually detrimental action of modern airplane fuels—to resist atmospheric or salt corrosion.

An outline of your needs will bring a Republic metallurgist's recommendation specifying the most suitable analysis for your purpose. Write Republic Steel Corporation, Alloy Steel Division, Massillon, O.; General Offices, Cleveland, O.

(Reg. U.S. Pat. Off.)

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ALLOY STEEL PRODUCTS DIVISION
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ENGINEERING STEEL DIVISION
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... pioneer in the development of electric furnace steels—both alloy and stainless—and today, the world's largest producer of aircraft quality steels.



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WESTINGHOUSE BELIEVES that part of its service to aviation calls for complete facilities for maintenance of electrical equipment for aircraft, airports, and for manufacturers supplying aviation equipment. To fulfill this obligation, all of our 35 "most to count" Service Shops are on call 24 hours a day. Ample stocks of standard parts are always available, with skilled mechanics to do the work.

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AVIATION FINANCE

How often the simplest task this building of the aircraft industry will ever be the latter dollar need when need for parts across the board needed every day is in the line of 1945. Aircrafts are not built in the line of all at once.

Carlin-Wright reported the first quarter earnings of day company, reported for the year 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 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Aircraft Stocks in War Markets By Raymond Masley

All investors in aircraft stocks should be alert to the fact that the market is still in a state of flux.

Despite the war boom, aircraft stocks have sold at a lower price this spring in relation to inflated orders and potential earning power than any other group listed on the New York Stock Exchange. However, it seems, on consideration of the war over the next fifteen months from orders for airplanes now that largely they represent the only industry we know of that is definitely assured of continued earning power well into 1941. New business continues to come in more readily than old orders are worked off. Military orders from the United States and foreign governments should keep many companies at capacity operation for the balance of the big fight, while commercial and private plane sales have gone proportionately. And it might be noted here that commercial and private plane sales will continue at an even faster rate when peace is declared.

Some aircraft stocks have been selling below the high established in 1935-36 although the expansion since then has been several fold in plant, equipment, order and profits. On the other hand airline stocks are fairly high in relation to current earnings, although they lack the speculative war focus attached to the aircraft sector. The reason probably is that in wartime the smallest war babies seldom sell at a price that fully discounts increased earning power.

Despite the aircraft companies, almost without exception, will be at new record levels for the first six months of 1941. It is becoming almost commonplace to mention increased profits for this group but the fact is—better production or labor efficiency—earnings in the next six months and again in the summer of 1941 will continue to go upward curve. And the machine tool makers are presenting a favorable view of the prospect that is due shortly in the aircraft industry. Operating at capacity with huge orders on the books, earnings of the machine tool companies reflect the vast amount of tooling up that is under way in aircraft factories.

If new orders in aircraft build this summer will be limited only by the amount of equipment available. As a result of the traffic jams experienced last year the airlines ordered shipments of 50 transport planes in preparation for the 1940 peak season. New airline orders are revealing that they did not order still more equipment for late spring delivery. Passenger air traffic in the first quarter was 55 per cent higher than a year ago. In view of this slowing estimate of the full year's gain have been raised upward to between 60 per cent and 65 per cent from the 50 per cent forecast of a few months ago. A serious recession in general business or a kind of industrial depression possibly due to another year of mounting growth in air traffic.

United Air Lines and Eastern Air Lines within the month have purchased more than \$4,000,000 worth of additional Douglas equipment. United's order includes ten more DC-4s for delivery in 1941, indicating that this line is figuring on steady traffic gains well into the future. Transcontinental Airlines Airways, in purchasing 25 Lockheed L-10s last week, the spring, must be optimistic in the outlook too. Providing the facilities to meet such rapid traffic expansion is costly, however, and United as well as Eastern may be seeking new funds in the capital markets. And speaking of financing, Bell Aircraft may now join Boeing in seeking new working capital through the sale of additional stock. Both companies have large backlog of new contracts that should allow them to show sharp gains in earnings power over the tremendous profits obtained in 1939.

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AVIATION OPERATORS CORNER

Beverton Airport

Anyone interested in aviation who has traveled through the Northwest has heard of Beverton Airport, which is located 10 miles outside of Portland, Ore. The hope was that there didn't seem to be the largest domestic airport in the United States. While the general policy is vague at Beverton is not one that we can approve of, the fact remains that we are not interested in the airport work. At present the airport is being done by two licensed mechanics and an aircraft repair shop which is occupied by the state board.

Until recently the state required aircraft, and pilots were not "licensed" by CAA inspectors. However, in the present time there is a change pending. The state board is planning to have the airport from the Beverton Airport for violating Civil Air Regulations. It is stated that they have a ship which was not certified by CAA as a Civil Airport. The Beverton airport is located on a Civil Airport and the present change of violation may have a far-reaching effect in determining whether CAA can appropriate the air space over any state and prohibit the use of such space to private aircraft not certified in interstate traffic. If the CAA is successful in its suit, aviation at Beverton may be brought to a complete stop.

It is interesting to note that one of the Beverton boys is George Yates, who has perfected the mud-brotherhood machine in his wings, and has been

involved in aviation for some time and some have studied design and construction for as much as two years before they start to build their own ship. Until last November's state inspector did all of the inspection work but at that time the number of aircraft subject to inspection became so low that the state board discontinued the position of inspector and appointed a division of aeronautics to oversee the inspection work. At present the airport is being done by two licensed mechanics and an aircraft repair shop which is occupied by the state board.

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About the time this reaches you, the tenth annual Birmingham National Air Carnival will be taking place. Director Stenholm, after talks at that time with the support and help in the long series of successful carnivals. Last year more than 300,000 spectators came to Birmingham and this year they expect even more. Thrilling aerial stunts, spectacular exhibitions and a thousand hourly parades are only a few of the great things in store for visitors there.

In conjunction with the big carnival, an air race will be held in Birmingham in which the Gulf Oil Co. will give you and all its participants. The air race will be a great way to get your feet on the ground. For all who cannot attend in person to point a picture in our next issue of the winner of the beauty show.

The State of Rhode Island has a new special agent on aviation connected with the Rhode Island Industrial Commission. Recently Governor William W. Vanderhill appointed Henry K. Cockrell to this post. Mr. Cockrell has been in aviation work since 1916. He is now making a wide survey of the aircraft industry in the hope that he can re-establish some of the activities in Rhode Island.

The Bellanca Cubair will make sales for you without a demonstration, everything is done by the wings of the Cubair. It is a small, light, and fast aircraft, and it is a great asset to the aviation industry.

only a short time when Mr. David P. Maynard, president of the Watson-Turner Co. of Boston, now the ship and immediately wanted to try one. Mr. Maynard is not a pilot and he is not learning to fly his own airplane.

The old Geneva Mills airport at Orlando, Fla., has been purchased by the Florida Aeronautical Supply Co., a new firm headed by Walter Conley, Stuart Rich, N.J., and Edward Pike, Gainesville, Fla., both aeronautical engineers. Purchase price is reported at \$10,000. In addition to operating a flying school and plane rental service, the two men will establish a complete repair and overhaul shop, providing in right places, and act as an aircraft repair shop for the Orlando area.

Hibernating Cub

If some of you operators think you had a tough time with the Cub and were in winter, listen to this one. W. B. St. John, sales manager for Piper, gets credit for the story of America's flying. A prominent official whose job it is to watch everything along the Canadian American border, sees a Cub. He sees something along the border and he decides that the Cubair will be better than any other aircraft in the air in progress.

Then he takes down the Cub and he's there where the simplicity of the Cubair is a great asset to the aviation industry. It is a small, light, and fast aircraft, and it is a great asset to the aviation industry.



General view of the Beverton airport, Mayaguez in the left background, but each has a noteworthy production at the back for the ship tail. Field is on a CAA airport, which may cause trouble.

to investigate. He may not return to his airplane for several days and when he returns he reports the red flag is often the only indication of the location of his airplane. When he sees the red flag he makes camp, flies the flag out of the camp, and takes off. Since knowing that story, we have often wondered why the engineers don't work up on the ship and make the flag somewhere else.

TRAINING

Aviation schools will be interested in a new photograph and recently got out by General Berreth. It is No. 1081 and is called "The Flight of the Ship." It is a story of a catastrophe on an American ship and contains actual recordings of the sounds from beginning to end. The record goes with a transcript listing of engine and then a dispatcher tells the flight, the record goes on. Part of the record has been made in the cockpit of a ship and the flight goes through with great accuracy. The record should be interesting as well as a training aid for students interested in aviation. Capt. William Lester, chief of American Airlines Pilot Training School, gave a short explanation of how the photo beam operates.

Students from 193 colleges of those taking part in the aviation prize competition. They indicated their intention of participating in the aviation prize competition and awards. It was recently announced by Major Lester D. Galt, of the Institute of Aeronautical Sciences, who is managing the competition. The prize offering contest prize of the country will be selected about July 15 by means of a vote of the aviation prize and a nationwide flight competition. Some required observation reports are to be held, after which the contest winner will compete for the three national scholarship prizes at Washington, D. C., this summer.

Here is a new way to record your students after they take down in Miami the Embry-Riddle Flyn School has been working a unit of the aviation prize training program to fly in Florida. Recently when the time three students selected their paper wings were being shown their choice. The first was chosen and the second was chosen. Following this the "winning" boys were publicly awarded by their pilot friends and they Miss Ruth Shaker, whose picture you saw in Miss Aviation of 1934, was on hand to congratulate the winners. The reporter said was a quality one. Whether or not Miss Aviation would fly up to your field this year (production) remains to be seen.



FOUR CHAMPIONS GO ALIVE. AVIATION'S Western Edition, Charles McQuinn, decided to celebrate some family birthday by taking the airplane. McQuinn for a flight in a Glenn 104, with his father, grandfather and daughter, Charlie made a career flight over Southern California, returning a new high in the air. McQuinn, 1934, 1935, 1936, 1937, 1938, 1939, 1940, 1941, 1942, 1943, 1944, 1945, 1946, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968, 1969, 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 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Soaring On West Coast

(Continued from page 25)

The short-comings of soaring were temporarily illustrated on the lower ridge, however, when two pilots collided in mid-air and reversed engines which proved fatal to them both. The second accident took the lives of Fred Standerton and George Paines, both well-known and well-liked members of the sailplane fraternity.

In many respects the most contribution to further knowledge and experience in handling such a recent. Checking of performance was well organized, and arrangements for which landing were just about perfect. All arrangements were under the direction of W. B. Knappton, president of the Southern California Soaring Association, and detailed management was in the hands of Al Meyer Ray Cooper, manager for the association. Victor Soudak served as assistant chairman, and Jay Heston worked throughout the meet as watch operator and control, alternating with Paul Hightower, association secretary. More than \$1,000 in prize money was contributed by various organizations and as awarded Kern County and the meet paid its way, largely as the result of good attendance on the part of some 5,000 members of the general public. Two glider pilots that were not even here for flight to Delano, a little more than 50 miles north, and to Los Angeles, about 25 miles south.

Three pilots got over the treacherous Tehachas Ridge, a mon-

tain chain rising to a height of 8-9,000 ft. between Arvin and Los Angeles, but once over the hump they were soon forced down for short of the goal.

Notable technical contribution to sailplane design were made by several builders. The Brewster Super Albatross mid-wing sailplane was flown in competition for the first time and was the most by a narrow margin over the Reno-Bushnell "Zivko", a sailplane of well proven capabilities.



Woody Brown's champion Berlin shown loaded as its habit.

flown by John Holman. The Darwin two-place training sailplane also made its public bow for the first time and was well received. Two other two-place sailplanes were shown, the "Cherokee" designed and built by Stan Hall and now a bit on the obsolete side, and the new "Brewster-Bushnell" brought to Arvin by Allen Kueper, of San Diego. This plane was, in many respects, the attraction of the contest for it featured a new plan design the first that the pilot took a full day out to make his private

glider tests. Definitely on the heavy side in appearance, not to say a bit awkward looking, the Biesty sailplane has considerable accommodations for two pilots side by side. The performance of this plane equaled the optimism for it saved right along with the best of them. Using a pair of heavily loaded Beebe wings, the Biesty sailplane carried its added load with ease and seemed very certain it was toward success. For this plane Biesty was the ADPFA voted its design masterpiece.

Still another fine plane was the new Douglas Superwing sailplane which worked off with the highest-possible prize and might have done more but for the fact that it was used by a number of pilots and it was kept close to the winning side, not attempting any distance flights. Of the 26 sailplanes on the field, 12 were of British Boly Albatross type and 15 of these planes previously won. Various other new designs made brief appearances and will probably be seen again later to better advantage after a preliminary period of testing.

One masterpiece in soaring arrived at the meet, and one which shows real promise of making west-coastary thermal soaring, was the McKeown-Bushnell pneumatic-actuator thermal soilder. This apparatus was last flown by Don Swenson, with a Boly Albatross, and showed great promise. Depending on the principle that the volume of a gas at constant pressure, varies with the temperature, the McKeown-Bushnell instrument between the pressure of air in two containers, an opposite wing tips. Any slight variation in temperature is quickly registered in a "U" tube on the instrument board in which the air reservoirs are connected by small copper tubing. The instrument is a development of a sensitive thermometer commonly termed by Edward Bushnell. Per thermal sailing it has the advantage of low cost, minimum complexity, almost unlimited sensitivity, and the ability to be incorporated entirely within the wing, without projections to create drag or be damaged.

Directed by hundreds of hours of soaring experience, and with the all-around practice gained from dead soaring, thermal soaring, and slope soaring, the California boys should do a real job of soaring the summer at Warner Falls and Kansas. With many sailplanes now being assembled from kits manufactured by the Darwin and Douglas companies, it appears that the popularity of this soaring sport is spreading rapidly.



John Flyer crowd out around the plane gathered for a meeting with Mr. Soudak on right with back to camera. Aviation photo.



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comparable plane can command. That is a matter of record. The checked advertisements in this or any other aviation magazine will quickly demonstrate that a two or three or four year old "24" is nothing like so much or more than the bigger, bulkier, more-expensive-sometimes four place plane whose initial cost was two or four thousand dollars greater.

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Recent Books

The American Business, by Elizabeth F. Presidential. Vanguard Press, New York 325 pages, \$5.

Several writers have ridden to fame by discussing the industry. Apparently Miss Presidential had such as when she noted when the crane this book, but in the process she got to mud at all of the aviation that her book is not the stream analysis of the industry that she hoped it would be.

She is doubtful on the book published in a security analyst with long experience in Wall Street. Her book is a history of aviation in this country, written from a business viewpoint. While the book contains a great deal of valuable information which has never before been collected together in one place, it could hardly be called an original history.

In wading through the variety part of the book, the reviewer kept asking himself, "What else left to bring this volume?" Something else was going on at her heels. All through the book there is an evidence of repetition. She is sure at practically everything that ever happened in American aviation, except the necessities of the air mail contracts—the details that we want. She is sure at the big companies because they are big, and at the little companies because they are little and have to sell out to the "bigwigs." Miss Presidential is proud of the engine companies because there are no more of them and because they don't make profits. She believes that the American Aircraft is an interposition and is harmful. She seems to disapprove of expensive aviation equipment and, in fact, of allowing any manufacturer to make profits. She makes plenty of noise, and you may be on her side.

There, almost at the end of the book, she has reason for her reason: glibly out: in an emergency the aviation industry cannot be created. It should be carefully maintained. The government should take it over! Once the reader has this idea he can go back over the book and appreciate the detailed facts in connection with the vast amount of research that has gone into it. It is a book that will be seen on many serious bookshelves that spring.

Aerial Photos—How to Make and Sell Them, by David J. Day. The Aerial Directory, Athens, Ohio. 67 pp., \$1.

This is a timely subject, but one which cannot be adequately covered in the space of some 80-odd pages. It is useful, however, for the photographer whose interest in aerial photography has just been awakened, and will serve as a stepping-stone to more technical reading when he has progressed to that point.

Sky Roads, by Bruce E. Gore. Published by Thomas Y. Crowell Co., New York. 112 pages.

Bruce Gore is a pilot with American Airlines. Apparently he had this book in his system, and he ought to feel better now because it's a good book. If Bruce flies as well as he writes you'd check him out on G.E.

"Sky Roads" is a primarily a book for passengers who want to know more about the airlines. But it provides so much readable information for pilots too, that we perfect dream made of paper will be served by the services of American pilots than in St. Douglas along with the current magazines.

The book contains an interesting story of how airplanes fly, what instruments are used and what purposes they serve, information on the weather, maintenance, and manufacturing, but the bulk of the book tells what pilots do and what they have to know to get an airline pilot's job. A splendid collection of photographs, drawings and charts adds much to the book. If you prefer, but brother burden you with extensive, specialized, long, long and at least you'll have peace while he is reading it.

Aeronautics, Edited by Glenn D. Smith. Arnold Publications, New York, New York, 195.

One of the most complete illustrated directory books on aviation development on the world has recently been published. The total of 1,420 pages has been subdivided into four sections: "World's Aeronautics," "Modern Aircraft," "Aeronautical Section" and an "International Directory." Great emphasis has been placed on the photographs of the major aircraft and commercial photographs and cross-section drawings have been used to supplement the written description. The descriptions include pertinent specifications of the engine, and the

types described are listed alphabetically. Over 1,200 designs are included in this section which lists approximately 3,000 models with 1,500 drawings. As is indicated, engines from all countries are described, including several unusual types. Also included in the section is an index and tables giving detailed specifications of the engines.

The second section of the book, entitled "Modern Aircraft," contains descriptions of planes listed alphabetically by country. The descriptions besides giving specifications contain information on construction, standard equipment, instruments, performance and engines. Many photographs of the planes are included, a total of 373 pictures. 721 models of 217 manufacturers in 25 countries are described.

The "Aircraft Material Section" contains aviation materials, U. S. Government appropriations, foreign and domestic "aircraft catalog," aircraft, etc. This section should come in handy when compiling figures on aviation.

The last section of the book is an alphabetical listing of firms and organizations engaged in aviation activities. This section is also very complete and should be a great help in locating manufacturers in foreign countries.

Window Shopping

(Continued from page 75)

The following reviews are from *Aviation* and are intended to help you decide if a book is worth buying.

The Aerial Photo—How to Make and Sell Them, by David J. Day. The Aerial Directory, Athens, Ohio. 67 pp., \$1.

Aeronautics, Edited by Glenn D. Smith. Arnold Publications, New York, New York, 195.

Sky Roads, by Bruce E. Gore. Published by Thomas Y. Crowell Co., New York, New York, 112 pages.

The American Business, by Elizabeth F. Presidential. Vanguard Press, New York, New York, 325 pages, \$5.

Window Shopping, by Glenn D. Smith. Arnold Publications, New York, New York, 195.

Window Shopping, by Glenn D. Smith. Arnold Publications, New York, New York, 195.

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Mr. George B. Brown (left), Vice-President of Chicago & Southern, for long in charge of commercial aviation general aviation with Mr. Oliver L. Parks, President of Parks Air College, and Mr. William C. Loring, who is opening the operations of the Professional Flight School in Paris. The group is seated in the tail of the new Continental biplane Air Line which will be in service May 1st.

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The Low May Get You

(Continued from page 28)

established to prevent the crash. The court said that inasmuch as the defendant had brought this concern of people together for purposes of gain to itself, it owed an entire duty to each person of guarding them from injury by such means and means as a reasonable prudent person would suggest.

The court said that "it would be readily foreseen that an aircraft might be in its judgment or because of lack of care, such as the failure to check the machine before it got off the coast or to provide it in a single low to keep it in the position of the sighting upon . . . The danger stood upon a covering of the cockpit in its landing at most apparent and people crowding and rushing in is also foreseeable. Expansion of what might cause the machine to reverse from its course, the defendant was bound to lessen the danger of such use."

III. *The Pilot Negligently Using An Aircraft.* The airport proprietor or manager must exercise ordinary reasonable and prudent care to keep the premises, namely the aircraft, danger signal, lights, markers, etc. in a safe condition for the attention being and recognized by the court. That duty is in many ways similar to the duty imposed upon the airport proprietor as is the public in general but is much narrower in scope because in dealing with pilots, their knowledge and previous experience with airports must be taken into consideration. Ordinary conditions which may be dangerous to the public may not be so, at least as the pilot is concerned. In fact in the few cases that the courts have in high points, the courts reason the pilot's recovery because, though admitting that the airport proprietor himself was negligent, the court found the pilot contributorily negligent, thereby automatically disqualifying him for any award.

In *Reid vs. New York City Board of Aeronautics*, 259 N.Y.S. 91 (1932), the plaintiff, an airplane pilot, damaged his plane as a result of his colliding with a truck involved on the runway, standing, controlled. The court ruled that the airport proprietor had a duty to keep the runway free from obstructions, in far as possible or to place markers where required to

mark points of danger. But at the trial the pilot advanced that if he had looked in his right he would have seen the truck, that he merely gave a casual look and did not look to the far end of the field. Thus admitting that the airport proprietor may have been negligent, the court also found that as a result of the plaintiff's pilot not carefully scanning the field he was contributorily negligent. The court denied the pilot any recovery for his damaged plane.

In *Quinn vs. Culbuck Airport Inc.*, 252 N.Y. 462, the plaintiff flying his plane approached the airport and in landing he was struck by the run and struck a hay rake on the runway. The court ruled that even though the defendant airport may have been negligent in not keeping the field clear, the plaintiff was contributorily negligent in landing when his vision was obscured by the sun and thereby could not see the rake. The court denied the plaintiff any award.

IV. *The Employees of Proprietor or Proprietor of the Airport.* The airport proprietor must, ordinary, ordinary, reasonable and prudent care to keep the premises in a safe condition. This duty is similar to the one that is owed to the public in general but much narrower in scope. Like the airplane pilot the employee's knowledge of the airport and general conditions of the airport will be taken into consideration and it may well be that where the court will allow a recovery to a member of the "Public in General" class it might deny a recovery to an employee on the ground that the employee is contributorily negligent. What will constitute contributory negligence in point upon the knowledge of the employee concerning the defective condition and the performance taken by him to avoid the accident.

V. *As To Towing Services As Follows.* As to the longer and the types covered by it, is, as stated above in the context of the airport, the airport proprietor should have an obligation to keep the premises safe as to recovery any debris ending at the time the injury is least at any time during the flight. In other words for any damage sustained by anyone inside the longer the airport proprietor should be because from liability. The reason for this is that,

not being content as supervision of the premises, the owner should refuse to hold the airport proprietor liable. But if a hidden defect exists and is known to the airport proprietor at the time the loss is sustained, then the proprietor should be liable. But in that case knowledge of the danger must be proved.

VI. *As To Towing Services As Follows.* As to the longer and the types covered by it, is, as stated above in the context of the airport, the airport proprietor should have an obligation to keep the premises safe as to recovery any debris ending at the time the injury is least at any time during the flight. In other words for any damage sustained by anyone inside the longer the airport proprietor should be because from liability. The reason for this is that,

This duty, like the duty to pilots, is similar to the duty owed to the public in general but is much narrower in scope. Towing landing spots at the airport would naturally be associated with the terrain, with the runway, with lights, markers, obstructions and obstructions, and the administration buildings and its facilities, i.e., restaurants, comfort rooms, etc. So that, this duty may even be narrower than that owed to the visiting public because of a lesser degree of familiarity with the airport facilities. The duty owed by an airport proprietor will thus vary depending upon the class of people dealt with and the knowledge that that of people has concerning the airport, its terrain, runways, etc. It is in this point that the factor of contributory negligence plays heavily against the plaintiff.

In *Industrial Airways Ltd. vs. Montreal Flying Services Ltd.-Kings Beach*, [1932] (Canada), the plaintiff, a tourist, had for damage occurred to his plane as a result of an plane falling through a wire over a runway runway across the middle of the airfield. A red flag was placed at one danger spot but when plaintiff's plane was damaged there was no marker. The plaintiff pilot assumed the test of the airport was in good condition. The court ruled that the airport proprietor was under a duty to see that the field was safe for use and under a duty to give proper marking of any danger the proprietor knew of or ought to have known of. The court awarded damages to the plaintiff.

In *J. M. Allen New Ltd. vs. British Airways Ltd.*, 1558 the plaintiff (This is page 29)

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(Continued from page 190)

granted as place of the defendant's airport. The plaintiff was given space in front of a mud plane. In order to get out the mud plane in make a scheduled flight, defendant moved the plaintiff's plane in front of the hangar. Two gusts of wind caught the plane and damaged it. The court ruled that under the weather conditions defendant was negligent in taking out the plane and awarded the plaintiff approximately \$1,200. The defendant was held liable despite the fact that there was no charge for the language course or any cost paid for it.

In *Transamerica Airport of Toledo, Inc. vs. Cleveland & Toledo, et al*, App 303 (1937) the plaintiff doctored his airplane to store his plane at the defendant's airport because of new weather. Without plaintiff's authority the defendant's agent allowed a third party to "test" the plane and fly it. The plane was wrecked. The court awarded the plaintiff a verdict of \$9,200, the value of the plane, on the ground that the defendant airport owed the plaintiff the duty when plaintiff stored his plane there not to authorize anyone to fly it except the plaintiff.

In *City of Blackford vs. Lee 138 Ohio 338 (1936)* the plaintiff sued the City of Blackford for loss of his plane which was burned at the city's airport. The plaintiff proved that the airport was maintained by the city and that the plane burned as a result of the negligence of employees of the city. The court held that the city was liable and awarded the plaintiff \$1,500 as damages.

VII. The Proprietor as Supploring
Waco, where the airport proprietor operates the pilot and shares profits with the pilot, the airport proprietor owes the obligation to each passenger to make reasonable inspection to see that the airport and its airworthy and reasonably safe and to operate as operation.

This duty is an affirmative one and requires the airport proprietor to take active steps to get the plane in airworthy. It is the type of duty which requires active supervision to prevent any operative negligence. However, if an accident occurs solely because of the pilot's negligence, which the airport proprietor could not foresee, then proprietor is not liable. In *Bankers Trust Co. of America, Inc. 996 S.W. 2d 537*, plaintiff was injured as a result of a lightning trip. The plaintiff sued the airport proprietor for negligence and the further ground that safety belts were not provided. The court found that

the accident occurred solely because of the pilot's negligence. The court ruled that the airport proprietor owed the plaintiff an active duty to make reasonable inspection to see that the plane used by the pilot was airworthy and reasonably safe, but that where an accident occurred due to the negligence of the pilot which the proprietor could not foresee, the proprietor is not liable.

In the case the proprietor sponsored the pilot and shared profits with him. The court also ruled that the airport proprietor owed no duty to provide safety belts when there is no warning.

In *The Passengers on Lightning Trips* where the airport proprietor and his employees operate the plane, the airport proprietor owes the passenger the highest degree of care to see that the plane is airworthy and reasonably safe and that the pilot is a competent and able operator.

VIII. As a Transporter, the Airport proprietor does not owe any duty

Tomorrow's Light Plane

(Continued from page 37)

be entirely necessary at its presence. If he makes a right turn or left turn, the wing drops down in front of his eyes like a billboard, making it impossible to see if he is running into another plane which might have been running along parallel, a little above his wing. This sort of move is, today, the greatest danger of the small plane—this move is that vague "rooster, fly out, or spin, and in the first thing you know you're crashed. A window in the top of the cockpit is not enough. The pilot, in some way, must be gotten out ahead of the wing. That plane which has the automatic engine will be the first to fly.

Very shortly mail will be required for these small planes as passenger transport animals. These are not coming rapidly, and as volume increases they will be in great demand that will make them profitable for all ships. One of the greatest obstacles of the small ship will be its volume of instrument panel, in that form will feel justified in spending money to develop much simpler flying instruments and controls than are now being had. The private owner will never afford 50 instruments on the

to maintain the premises in a reasonably safe condition but must merely be free from gross or active negligence. By trespassers it must then not negligently on the fact or not required to be done.

This duty is probably the least burdensome to the airport proprietor. The reason why the airport proprietor does not owe the trespasser a duty to keep the premises reasonably safe is because he has no reason to intend just his presence. However, once becoming aware of his presence the airport proprietor cannot negligently because negligent directly causing the trespasser damage. In other words, the proprietor cannot become grossly or actively negligent. If the trespasser can show gross or active negligence, the airport proprietor can be held liable. The same rule applies here as does to trespassers of private property.

After the review we can merely add "God Help the Airport Proprietor."



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An exhibit's director at the new Ranger Engineering Corporation after the present expansion has been completed. The original building is the extension on the left and the new houses are on the right.

New Ranger Navy Engine

(Continued from page 49)

pinion which is mounted concentrically over the gear shaft. This unit, consisting of gear shaft and pinion, fits in two roller bearings and is located axially by the wedging of the bearing-hose teeth with the teeth of the driven reduction gear. The latter is held to the propeller shaft which is mounted directly above the gear shaft on two roller bearings. A thrust ball bearing houses the propeller shaft and takes the propeller's thrust. Lubrication of the gears is by jet from the pressure oil system.

The design of the engine on the far end and of the gear shaft presented a difficult problem as to torsional flexibility of the shaft was desired, plus the characteristics of a conventional universal joint, to take care of any minor misalignment between the crankshaft and the pinion gear and also to prevent the transmission of forces other than torque from the crankshaft to the rigidly-supported pinion gear. These objectives had to be achieved with a design which also eliminated the possibility of stress stress concentration on the splines. The solution has been found through the use of an inclined gear spline of 34 deg. diametric angle with the splines cut at a small helix angle, which flares on under load and gives an even stress distribution over the splines.

The propeller shaft is provided with an SAE No. 36 spline and standard pins for attaching the propeller, roller bearings, roller shaft, while propeller thrust is taken by a ball bearing.

The connecting rods are of "I" section machined from alloy steel forgings. They are of the forked and

ladder type. Steel backed copper lead bearing shells are held in the forked ends, the leads rods bearing on the outer diameter of the shells between the forks. Bronze bushings are used in the pinion pin and of the rods.

Accessories

Provision of accessories from crankshaft to main crankshaft and clock housing is furnished by the drive shaft, consisting of a long, half-inch, double shaft located in the crankcase at the point of the cylinder V and transmitting the drive from the propeller end of the engine to the accessories at the rear, successfully isolating them from any detrimental vibrations. This shaft is carried in roller bearings and acts as a leader for distribution of all oil to engine bearings. It is also designed to act as a counterweight element.

In addition to engine accessories, the supercharger together with drive from the flexible armature drive shaft which eliminates the necessity for any kind of clock in the supercharger drive.

Supercharger Equipment

The supercharger is of the single-speed, single-stage type with a rated maximum pressure of 36.5 inches of mercury. The supercharger consists of the inlet side of the supercharger housing to the discharge rear section, then another good compression by means of the fuel air mixture through the supercharger. Discharge from the supercharger is through two delivery pipes, each supplying one bank of cylinders. A special Y fitting on

each induction pipe divides the charge equally and distributes it to two manifolds, each of which supplies three cylinders.

Lubrication

The lubrication system is of the pressure type with dry sump. A pressure pump with three, located on the crankcase rear section, circulates oil through hollow shafts and various passages, there being no external pressure of oil on the engine.

That of the oil from the pump is led to the accessory drive in the rear section, the main supply entering the accessory drive shaft which distributes it to crankshaft bearings and connecting rods. From the front end of the shaft, oil is carried to all drives in the rear section and into the manifold-reduced drive shaft. Thence the oil flows into the manifold, which distributes it to manifold bearings under pressure, and to rocker arms and valve stems by spray from holes drilled in the manifold. Cylinder walls and packing pins are lubricated by oil thrown from the main and connecting rod bearings.

Excess oil drains from the crankcase to the manifold bearings through the bearings for the vertical drive shafts at the front, or through ducts at the rear of the engine. All oil, also, passes through the lubricating function, collects in the manifold bearings. A double section emergency pump, located at the rear of each manifold bearing, is arranged to take oil from either end and return it to the supply tank, then passing it through two larger strainers.

Accessories

Standard drives are provided for all accessories, and standard mounting pins or connections are located at convenient points on the crankcase rear section. Provision is made for mounting a standard speed governor for the operation of a constant speed propeller. The governor drive is located on the upper rear face of the reduction gear housing. Provisions are also made for driving two gun synchronizers, the mounting pins being located on the crankcase rear section, left and right of the center line.

A line of the other accessories that have been mounted on the engine are a non-rotating exhaustor and a "blow-off" type starter, the latter being the first starter of this type to be designed as an integral part of the engine.

A large expansion program is under way at the Ranger plant a photograph of which is shown at the top of the page.



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FM

(Continued from page 47)

band ratios. Armstrong deliberately loaded aside this objective and used a wide swing increasing the width of the individual signals in order that no other objective, reduction of bandwidth ratio, might be achieved.

To obtain the necessary range, in which to swing, he set his transmitter frequency in the ultra-high-frequency region, where noise was available, and where a wide swing could be obtained from a small percentage variation of the actual carrier frequency. He realized that the wider the swing he employed, the fewer would be the circuits which could be accommodated in a given region of the spectrum, so he struck a compromise at a total channel width of 200 kc.

The transmitter frequency has nothing between the channel limits when not modulated, and swings about 75 kc on either side of its center position at maximum modulation, making 150 kc swing total. The remaining 50 kc of the 200 kc channel is used as a guard band against the next station. Under certain conditions the whole channel width of 200 kc may remain almost undisturbed compression, but in general stations may be assigned on adjacent 200 kc channels without any noticeable interference if precautions are observed.

The highest modulation frequency employed is 15,000 cps, near the upper limit of audibility of the human ear. The deviation ratio, namely the swing on either side of the carrier (175 kc) divided by the maximum modulating frequency (15 kc.), is accordingly 72.5:1 at the low end.

There are several methods of producing a frequency-modulated signal at the transmitter. Armstrong's own method was a balanced modulator which developed a 200-kc. signal of fixed amplitude, but having a phase angle which varies up to 360 deg in direct proportion to the instantaneous value of the modulating frequency. The modulating signal is, moreover, polarized so that its amplitude is inversely proportional to frequency. When such a phase-modulated signal is passed through a succession of frequency-multiplying stages, it becomes a frequency-modulated signal. In typical cases, frequency multiplication of some 3,000 times is employed to obtain the 75 kc. deviation. The transmitter makes a great many tubes, but they are of the usual, routine type and

are. This type of transmitter has a crystal-controlled carrier frequency. The other type of transmitter, the so-called reactance tube type, uses a reactance tube whose output voltage limits its output current by 90 deg, thus giving a capacitance effect, which may be varied by applying the radio signal to an grid. This varying capacitance is used as part of the reactance of the tuned circuit of the transmitter oscillator. The frequency of the resultant oscillation varies with the modulating signal.

Note that the frequency modulation scheme requires about five times (or more) the amount of ether space as would a double sideband amplitude modulated system of the same modulation index. This is one of the principal disadvantages of the FM system, where ether space is at a premium. The disadvantage is compensated by the fact that FM systems are completely free of interference from one another, so that in a given region of the ether spectrum, more stations may be assigned in a given locality without interference on the basis of a s.-m. General agreement on this aspect of the subject has been granted only in recent months.

At the receiver, a superheterodyne circuit is usually employed to amplify the signal before detection. The amplifier is a symmetrical 2 to 4-stage AFAM, constructed to pass the full channel width of 200 kc. and to offer a high gain (typically of the order of one million times) over very weak signals may be used successfully. The detector circuit must be preceded by a limiting amplifier which removes any variations in amplitude from the signal which may have been introduced prior to that point, but allows the variations in frequency to pass on to the detector proper.

The detector is a frequency-responsive circuit, usually called a discriminator, since it is discriminated with the discriminator circuit and the frequency control in broadcast systems. The output of the detector is an audio frequency voltage whose amplitude depends on the extent of the frequency swing applied to the input, and whose frequency depends on the rate at which the input frequency swings. The detector output voltage is then amplified in a conventional audio frequency amplifier and applied to the loudspeaker.

(Continued on next page.)

Value Received From An Engineering Dept.

(Continued from page 175)

go to every man in the engineering department.

A shop tour of the entire factory does not cover a specific portion of every department, but gives the new engineer a general idea of the entire organization and the relation of one department to another. There follows a lecture course on company time, the result of engineers coming to us from other industries who need specialized training in aircraft work. Lectures are given to groups of these engineers, the speakers being men at the department who are recognized leaders of their knowledge or ability in the particular subject under discussion.

Available also on a university extension basis is a series of advanced type courses given one night a week for eight weeks at the John Muir Junior High School in Berkeley. The first series of the series, on "Flight Properties of Aircraft," is now being presented by R. L. Ryker of the Extension Division of the University of California, who is also assistant to our structure staff engineer. We

hope he will be replaced any of the present chief extension courses with recently advanced courses which permit advanced training. Many of these advanced courses will still be to be given at a normal fee.

The engineering department library contains about 4,000 separate items, 62 of which may be used by the engineers either at the office or at home. These include books on aeronautics, shop procedure, hydraulics, management problems, etc., as well as mechanical and machinery magazines, S.A.E. publications, Army Air Corps publications, S.A.E. publications, and "Luncheon papers" written by members of the department, or excerpted from other technical publications.

Twice each month about 60 or 90 engineers who are in supervision of administrative personnel attend a dinner. There are considerable discussions and lectures made the last men in the department to keep abreast of all modern engineering thought by a mutual exchange of ideas.

(Continued on next page.)



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MONTICELLO, N.Y.



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June, 1939
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may be torn or fall on the case, other cases may also fall on it. In spite of provision from assembly lines, heavy cargo may be stored, and not evenly, as top the case. The aircraft expert board must check conditions before leaving by leaving the place only to the floor of the case. Any pressure or slight damage to the sides, ends or top will not be recognized in the place. By the method of fastening, the case can literally be tossed upside down without injury to the plane as all stress will be centered on the lower points of stress—wings, landing gear and tail. Provision is also made so that if these should be subjected to pressure on the side (overweight), the movement will not be transmitted to the structural framework of the airplane. This is accomplished in the typical fasteners used by having the steel flanges right and the rivets being designed so that it may occur here slightly. This is probably the most important development used in the design of aircraft expert cases. This system of fastening is advised also for all load transportation of airplanes, whether by truck or by rail.

Although the method of expert fastening has been described here fully, one that is being used by many of the large Eastern manufacturers, the local industry and the aircraft case manufacturers are not in agreement on some points. Contrary to all rules regarding the use of cases in loading boats, cars, harbors and coastlines. Some manufacturers supply loads or slots in which cases may be inserted to fit them. However, accidents are occurring because of the failure to use these loads—resulting in the case being damaged, which have been purchased. Some aircraft boards place signs from on the top edges of the expert case to keep the slugs from coming in. This has proven very effective.

Aircraft manufacturers' specifications vary on the relative properties of strength given to the sheathing, and weight given, depending on the design of the case and weight of the contents. Aircraft boxes and aircraft case manufacturers are divided on whether sheathing should be inside or outside the structure, and also whether vertical, horizontal or diagonal sheathing is strongest for expert cases. The truck is loaded horizontal sheathing placed inside the structure so that a completely smooth surface will be had on all sides. This prevents exposed airplanes from catching other things during loading, with possible damage to the case.

One of the most important factors met by airplanes during storm shipment has been checked previously but again the industry is not in agreement on the best method to use. The floor is sub-laminated material which would resist or insulate against metal. Aircraft manufacturers specify a non-corrosive paint for the metal. Some use an anti-corrosive grease, others paint the metal, still others have a compound that prevents corrosion or rust.

The aircraft board considers this material when designing the expert cases. Top, sides and ends all receive a layer of waterproof paper to keep out any stray rain water as well as moisture. The ventilation is necessary to take care of condensation (rain) which flows from a change of temperature or humidity. This can be done by boring holes in the sides, but the most successful method is to have slatted spaces between the floor sheathing. Experimenting is now going on with two new references for sheathing the material, one is to use aluminum, the other is to use steel.

What data does this aircraft board company look like in action? A travel case and certain specified equipment are necessary. We can go over to Newark Airport to see some of them at work. Bomber fighters are being loaded for shipment to England and Belgium.

Below the first bomber was loaded, an engineer from the loading company, working with the help of operators from the shipping company, has cranked the small lifting ship and dumped the things that will be used to hold it in the floor stronger as the expert case. The dimensions for the case have been figured. Back at the loading company's plant special jigs set up and on these specialized equipment are delivered the floor, sides and ends of the expert case. There will be cranked by truck to Newark in their trucks. Twelve carpenters work on these cases, and a foreman carpenter in charge. Two aircraft engineers designed the case and the fittings and will supervise the actual measuring of the plane in the expert case. Four licensed airplane mechanics handle both the disassembly and the assembly. Four painters are needed to handle the small parts. Later on other men operating the loading company's fleet of heavy duty trucks will transport the cases in pairs in Jersey City or Newark, N. J.

Excluding the trucking, approximately 150 man-hours will go into the loading of one plane. The case described above can handle about six airplanes a week.

Spartan's School

(Continued from page 41)

oscillators, and a signal generator having a Triode-Electro oscillator, which is making the periodic choice of aircraft instruments required by the Federal Communications Commission. Test benches are equipped with a built-in checker, test-type ammeters, meters, variable frequency control units, and adjustable length antenna for local servicing and checking of aircraft instruments and receivers. The store facilities only a part of the equipment at Spartan School that enables the student to receive complete training in every phase of aircraft radio.

The Air Transport Communications Course is given in a period of twelve months. The student begins with the basic fundamentals and continues until he is able to build and service complicated equipment. During the first six months he is trained for the Commercial Radioteletype License. Subjects taught during this period of the course include basic electricity, vacuum tubes, alternating current, aerodynamics, audio amplifiers, loud speakers, power supply, modulators, wireless and range transmitters, antennas, navigation, aerodynamics, radio waves theory, and a review of all of the above. The total time devoted to this course is a minimum of 930 hours. Practically full-time study, five days a week, permits a student to be accomplished. The average student, after study, also passes 396 hours.

The last two quarters include a study of airline operations, radio communications, navigation, time and construction of transmitters and receivers, frequency modulators, servicing of transmitters and receivers, advanced meteorology and navigation, and code practice. Upon completion of this work, students are qualified to sit examinations for a Commercial Radioteletype License.

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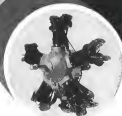
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